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ROTTERDAM (Holland)

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# **INTERNATIONAL REVIEW OF POULTRY SCIENCE**

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EDITOR:  
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# BREEDING

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*Hen Breeding Contest.* The U. S. Egg and Poultry Magazine, Sept. 1934.

Some good things should result from the plans of New Jersey authorities to convert the Vineland egg laying contest into a hen breeding contest.

They propose to take the pullets which come through with good first-year records at the Hunterdon or Passaic County contests and continue these birds at the Vineland plant as long as they produce satisfactorily. Pedigreed males will be mated to these selected hens to secure pedigreed hatching eggs, the owner rearing the resulting chicks on his own farm. The cockerels grown will then be used to head flock matings.

This plan should go far toward increasing long life and continued productiveness in the flocks of co-operating breeders.

*Factors which influence the Egg production. Fattori che influenzano la Produzione ovaia e Correlazioni fra Numero di Uova deposte, loro Peso medio e Peso della Gallina.* Dr. R. Mazzoni. Istituto Zootecnico e Caseario per il Piemonte. Rivista di Avicoltura, Vol. 4, 1934, p. 243.

## Conclusions:

1. The yearly production of a hen has no connection whatever with the average weight of the eggs. The correlation-coefficient is  $r = +0.0180 \pm 0.0771$ .

2. The weight of the hen has no relation whatever to the ability of laying many or few eggs. The coefficient is  $r = +0.0201 \pm 0.0770$ .

3. The average weight of the eggs has a very slight positive connection with the weight of the hen.  $r = +0.0854 \pm 0.0208$ .

*Hereditary and environment factors affecting variability in egg production.* Hays, Massachusetts Agricult. Exp. State. Amherst. Mass. 1933.

The experiment was carried out with three inbred lines of Rhode Islands. Line A was chosen on account of special qualities in regard to the winter pause. Commencement of the lay and robustness of the birds. Line B showed special qualities in connection with laying capacity. Line C very high egg production. Each line was controlled in four generations.

It was ascertained that closely related birds apparently commence laying at about the same time provided environmental conditions are similar. Winter production also depends a great deal on capacity.

When brother and sister are paired tolerable qualities are ob-

tained. The winter pause is dependent just as much on hereditariness as on external conditions while broodiness is influenced more by hereditary qualities than by environmental conditions.

*Selection on account of the Value of Descendants. Zuchtwahl nach Zuchtwert.* Dr. A. L. Hagedoorn, Archiv für Geflügelkunde, Vol. 7, p. 276.

**Summary:**

The author writes about a method of breeding without trapnests, namely the selection of birds on account of the value of the descendants of the male. The average laying results proves his breeding value. If the daughters of one cock are in one pen, it is possible to see the best breeding males by calculating the utility of the pen (difference between eggs and food). This is a selection after the genotype of the male line which is more safe than that of the female line because the descendants are more numerous. The best way is, to select in both ways.

*Results of first and second laying Year. Erträge in einem Legebetriebe unter Berücksichtigung verschiedener Alters- und Leistungsgruppen.* R. Römer, Halle/S.-Cröllwitz and Walter Hellmers, Berge b. Nauen, Archiv für Geflügelkunde, Vol. 7, p. 146.

**Summary:**

A flock of 222 hens, kept up to the end of the second laying year, was examined in the different hatches with reference, to the best laying results, the highest surplus and the difference between the laying groups of the first year and the second year. The flock of birds from February-, March-, April- and May-hatch year 1930 brought in the average during the first year (including the pullet eggs) 219,8 eggs. At the end of the first year the surplus of the May-hatched birds was highest, because till the first day of clearing (Oct. 31. 1931) the feed consumption was least and the egg production on account of the intensive rearing was mainly in the months of high egg prices. Therefore the May-hatched chicks can be recommended to the poultry farmer, who rears his birds intensively, but not to the agricultural farm, because there must be feared that these late hatched birds will not ripen early enough. Or the agricultural farmer buys two or three months old pullets, hatched in May, raised on poultry farms and these birds will begin laying in the right time.

The flock of 222 birds brought in the second laying year in the average 152,9 eggs ech. This production did not cover the expenses. The investigations on account of the different hatches showed the same results.

Only those hens, that layed still in October (at the end of the first laying year) showed no loss because they layed more than 165 eggs; 10 % of the flock held this line. Besides these, 15 % showed a surplus because they layed up to 185 eggs.

Therefrom results that the flock owner who does not trapnest ought to rejuvenate each year the whole flock because it is a loss to hold the birds partly or not sorted during the second year. The poultryman, who trapnests his birds has to remove regularly the hens, that do not lay and holds only 15 % (extremely 25 %) of the flock in the second year, namely those birds which remain laying.

A generalisation of these results is self-evidently not possible. Climate, different prices for eggs in single months, other prices for feed and lower egg production can influence the result.

*Subsidies for the Purchase of Stock for Poultry Raising in Germany.* Poultry Record, 1934, p. 120.

In accordance with the terms of a recent circular, the Ministry of Agriculture of the Reich is granting subsidies to poultry breeders for the purchase of chickens and one-day chicks. The stock must come from the approved breeds recognised by the State and having a state recognised flock book. A poultry farm is generally granted a subsidy for the purchase of from 80 to 100 one-day chicks or of 15 to 20 pullets. In certain cases a subsidy sufficient for the purchase of 200 one-day chicks or 40 pullets may be granted. Estimating the average price of one-day chicks at 60 pfennig and of pullets at 2.7 marks, the subsidy amounts to 20 pfennig for each one-day chick and 60 pfennig for every pullet. Subsidies will be granted only for chickens hatched by May 15th, 1934.

*Relation of weight at sexual maturity to annual egg production.*

F. A. Hays, Poultry Science, 12, 1933, No. 1, pp. 25, 26.

The records of 2,091 Rhode Island Red pullets in the flock at the Massachusetts Experiment Station were divided into class intervals of 10 for annual egg production and class intervals of 0.5 lb. for body weight at sexual maturity. The range for production lay between 31 and 300 eggs and for body weight between 3 and 9.5 lb. The correlation between body weight taken at first pullet egg and annual production was negative, amounting to 0.3721 for the birds studied. Its squared value was 0.1385, which was interpreted to mean that approximately one seventh of the variability in annual egg production could be attributed to variability in body weight at first egg.

*A three-year study of the influence of continuous light upon s. c. w. Leghorn hens.* R. Penquite, Oklahoma Experiment Station, Stillwater. Poultry Science, Vol. 11, 1932.

A consideration of the effects of continuous light upon the egg production, body weight, fertility, and hatchability of the eggs laid. All birds were housed in a straw loft house 14 × 14 feet square and fed the standard A. & M. laying ration.

The continuous lights did not increase or decrease to a significant degree the total eggs laid.

In all lighted pens the birds weighed more at the end of the experiment than at the beginning.

The fertility and hatchability were not lowered below that of the controls.

The hens with lights laid more eggs in November, December, and January than the controls as shown by percentage production, the peak of production coming in November and December, whereas the peak of production for the controls was March and April.

Apparently the continuous light did not have a deleterious effect upon the birds used in this experiment.

*Temperature and its effect on egg size.* N. L. Bennion and D. C. Warren, Kansas State College, Manhattan. Poultry Science, Vol. 11, 1932.

In studying some of the factors influencing egg size, the mean weekly egg size was obtained for 125 Single Comb White Leghorns and 50 Single Comb Rhode Island Reds for a period of 52 weeks, starting

October 1, 1921, and ending September 30, 1922. These data were obtained from the records of the Poultry Husbandry Department of Kansas State College. All eggs were weighed daily to .5 gram.

A graph representing both the mean weekly egg size and the mean weekly maximum temperatures for the above period showed a very definite effect of high temperature upon egg size. When the mean weekly maximum temperature went above 85° F. there was a sharp decline in egg size. With the return to lower temperatures, the eggs recovered most of their loss in weight. During the last two weeks in August, when the temperature was up to 100°, the mean weekly egg size was over 4.25 grams smaller than it was in February. Excessively-low temperatures had no effect on the size of the egg.

To make a more critical study of temperature and its effect on egg size, 32 females were selected and kept in individual batteries in a temperature controlled room from April 30 to July 4. During this period the birds were kept under alternating high and moderate temperatures. There were three periods of high and three of moderate temperatures. Daily mean egg size was recorded and it was found that with the application of continuous temperature of 85° F. and above, the egg size decreased within 48 hours. During each high temperature period the decrease in egg size was from 4 to 8 grams. The response to the change from moderate to high temperatures was much more immediate than to the change from high to moderate temperatures.

At the end of the experiment the temperature was held at 97° F. and the egg size was 9.24 grams smaller than on May 19, which was before the second application of heat. This was a 17 per cent. decrease in egg size.

The birds consumed 12 per cent. less feed per day under high temperature than during normal temperature and the water consumption was practically the same. However, tests indicate that reduced feed consumption was not a factor in the reduction of egg size.

In both breeds the egg size gradually increased until the second week in February. From this month until the last week in May there was very little fluctuation in egg size. It is generally agreed that in recording a bird's egg size the period before it reaches its maximum should be avoided. It now appears desirable also to avoid the summer records because of the influence of high temperatures. The period of February 15 to the end of May seems to be least affected by external factors.

*Canadian registration of Poultry.* W. E. McKim, Dominion  
Registration Inspector, Lethridge, Alberta, Canada.  
*Poultry Science*, Vol. 11, 1932.

Registration work with poultry in Canada started in 1922 and has continued to expand steadily year after year. This activity is conducted by the various egg laying contests in each province of the Dominion as part of the work of the Experimental Farms System.

The following figures show quite clearly what advancement has been made both in numbers of birds entered and in average production during the twelve years the contests have been in operation. Regulations restricting the counting of small eggs were, to a very large extent, responsible for the drop in production in and following the year 1926-27.

Contest Year	Total Birds	Average Production
1919-20	1610	122.6
1920-21	2480	134.5
1921-22	2590	146.3

Contest Year	Total Birds	Average Production
1922-23	3000	165.0
1923-24	3710	169.6
1924-25	4100	172.2
1925-26	4220	179.5
1926-27	4210	172.5
1927-28	4230	175.4
1928-29	4370	176.5
1929-30	4320	178.1
1930-31	4560	176.5

The above figures show the gradual increase which took place in production. As production increased the numbers of small eggs increased at a remarkable rate. Regulations were put in force to eliminate entirely eggs which weighed less than 20 ounces per dozen, and to refuse recognition to all birds which laid eggs which did not average 24 ounces per dozen in their pullet year.

#### *The value of registration.*

The registered male is the harvest of registration work—he is the result of years of careful breeding. The breeder of registered poultry is ever mindful of the demands of the public and has improved not only the utility side in his stock, but has combined beauty with production. Leading stockmen have long recognised the value of the registered sire and the registered male bird plays even a more important part in the breeding pen than the registered sire does in the flock or herd.

As the pedigree of the breeding sire is valuable only to the extent of its authenticity, the registered male's records are official records and the quality of registration has no substitute.

#### *Significance of short-time egg yield records. W. C. Thompson, Poultry Science, 12, 1933, No. 3, pp. 179-183.*

The trap nest records of the Passaic County and Vineland egg-laying contests were analyzed at the New Jersey Experiment Stations to determine whether any short-time-period egg yield record could be used as a criteria of selection.

The results indicated that the correlation between egg yield during the first 4 months (winter period) and annual total egg production was definitely positive, quite significant, and reasonably reliable as an index of annual production. The standard error of estimate for this record was large enough to show that it was not accurate enough to define annual egg production total. However, since the record was made just after pullets reached sexual maturity and were in strong physical condition it may be more accurate than either the coefficient of correlation or the regression equation indicated.

It was suggested that on the basis of these records pullets may be divided into three groups: (1) Those producing between 40 and 60 eggs during the winter may be expected under normal conditions to have an annual production of between 175 and 205 eggs, (2) those laying between 60 and 80 eggs, an expected production of 205 to 235 eggs, and (3) those producing more than 80 eggs, an expected production of more than 235 eggs.

It was also suggested that if pullets on which trap nest records were kept during the winter period were again trap-nested in 30 days, beginning about August 25, a still more efficient criterion of selection would be established. The correlation between egg yield for the months of December and January and annual total egg production was scarcely



of significant value. A correlation of  $0.8103 \pm 0.0068$  was found between the percentage of first-grade eggs produced during January and the percentage of similar eggs laid during the year. On this basis pullets that produced less than 60 percent of first-grade eggs during January should not be used for breeding purposes when the aim is to improve egg size.

*Relation between body weight and age at sexual maturity.* F. A. Hays, Poultry Science, 12, 1933, No. 1, pp. 23-25, fig. 1.

An analysis was made of a total of 820 Rhode Island Red pullets bred for egg production and hatched at 11 weekly intervals from March to June at the Massachusetts Experiment Station. The birds were grouped into 17 age classes of 10 days each and into 10 body-weight classes with a 0.5 lb. range. The minimum age at sexual maturity was 150 days and the maximum 319 days. The weight at sexual maturity ranged from a minimum of 3.5 lb. to a maximum of 9 lb. The correlation between age and body weight was  $0.468 \pm 0.0184$ . The data were interpreted as evidence that the significant variations in body weight at first egg were entirely due to differences in age. The data also indicated that body weight was an explicit function of age between the limits of 150 and 319 days.

*Characteristics of non-broody and intense broody lines of Rhode Island Reds.* F. A. Hays, Massachusetts Sta. Bul. 301, 1933, p. 12.

Continuing these studies, two lines of Rhode Island Reds bred for nonbroodiness, respectively, were carried for a period of nine years to study the nature of the broody instinct and its relation to fecundity.

The two lines proved to be practically the same in age at sexual maturity, winter clutch size, and annual persistency. The nonbroody line had a shorter winter pause and had more families free from pause than the broody line. During the experiment the mean percentage of nonbroody daughters was 72.7 in the nonbroody line and 20.5 in the broody line. Dams that were free from broodiness for three or more years produced significantly greater numbers of nonbroody daughters than did dams that were free from broodiness only one or two years. Broodiness could not be entirely eliminated by the selection of aged broody-free dams.

The nonbroody line had  $2.63 \pm 0.16$  broody periods and the broody line  $3.99 \pm 0.11$  broody periods during the experiment. The fact that daughters showed a definite and consistent increase in degree of broodiness as the number of broody periods of their dams increased proved that the degree of broodiness was inherited.

There was no difference in the mortality in the laying houses between the two lines. The mean winter production was about 12 eggs greater in the nonbroody line. The annual egg record was significantly higher for the nonbroody birds in the nonbroody line than for nonbroody birds in the broody line, and the same was true of the broody birds in the two lines. When all birds were considered, the average annual egg production was  $209.8 \pm 1.67$  in the nonbroody line and  $179 \pm 1.34$  in the broody line.

*The egg production of daughters in relation to the hatchability of their dams.* M. A. Jull and T. C. Byerly, Poultry Science, 1933, p. 313.

Data have been secured on White Leghorns and Rhode Island Reds at the U.S.D.A. Animal Husbandry Experiment Farm at Beltsville, Md.,

to show whether the selection of dams on the basis of high hatchability would be conducive to high egg production in their daughters. For each of three years and for three years as a whole, the mean egg production was determined for daughters of dams whose hatchability was below the mean hatchability of each pen and for the daughters of dams whose hatchability was above the mean of each pen.

The results showed that breeding for high hatchability was not antagonistic to breeding for high egg production.

*Mean annual egg weight in relation to mean weight of first ten eggs laid.* M. A. Jull and A. B. Godfrey, *Poultry Science*, 1933, p. 310.

The U.S.D.A. Bureau of Animal Industry analyzed the records of four flocks of White Leghorns, three of which were bred at the Animal Husbandry Experiment Farm at Beltsville, Md., and one at the West Virginia Experiment Station. The birds of each flock were divided into two groups according to whether the mean weight of the first 10 eggs of each bird was below or above the mean egg weight per bird of the first 10 eggs of all the birds in the flock. The mean annual egg weight of the birds of each group was determined.

The coefficients of correlation were high enough in each case to confirm evidence of the tendency for birds that lay relatively small eggs when they begin laying to lay relatively small eggs throughout their first laying year.

*Experiments with poultry.* New Jersey Agriculture, 1933, p. 6.

Preliminary results with individual laying cages indicated that pullets placed in these cages when ready to lay would go through the first laying year in satisfactory condition. An all-mash ration containing approximately 14 percent of protein gave the best results. Under these conditions there was a reduction in the loss of birds due to prolapsis of the oviduct, but there were indications of kidney and other internal disorders. There was no saving in labor from the use of cages, and difficulties were encountered in the proper lighting and ventilation of houses.

Evidence accumulated during the year indicated that the capacity to produce a large quantity of eggs was not related or correlated with capacity to produce large-sized eggs.

*Poultry breeder selection.* W. C. Thompson, New Jersey Stas. Hints to Poultrymen, 21, 1933, No. 1.

The technic of breeder selection, based on the inexpensive method previously noted, is explained in this pamphlet.

*Breeder selection.* W. C. Thompson, New Jersey Agriculture, 1933, No. 5.

An exhaustive statistical study of more than 5,000 trap nest records showed that the egg yield during the 4 months' winter season was a reasonably useful criterion of measurement of inherited egg-producing capacity. There was no correlation between the capacity to produce eggs in the winter season and the capacity to produce eggs during the summer-fall season. On the basis of this analysis it is suggested that if trap nesting were stopped on February 1 it could be resumed on August 1 for those individuals that had a winter record minimum of 60 eggs. Such

a scheme could be employed readily on the ordinary farm and would reduce the cost of obtaining records on breeding stock. Weighing the eggs produced during January was suggested as a measure of the capacity of the bird to lay large-sized eggs.

*A biometric study of moult in white Leghorn hens.* Walter A. Hendricks, Bureau of Animal Industry, U. S. Department of Agriculture, Washington, D. C. Poultry Science, Vol. 12, No. 5.

The results of the study reported in this paper may be briefly summarised as follows:—

Feeding certain inorganic sulphur compounds to laying hens had no consistent effect on the length of the moulting period.

Birds which moulted late had shorter moulting periods than birds which began to moult earlier.

Birds which moulted slowly had a higher rate of egg production during the moulting period than birds which moulted more rapidly.

Egg production was retarded more severely during the part of the moulting period involving the growth of new tail and wing feathers than during the rest of the moulting period.

The time required to start moulting and the length of the moulting period appeared to have no effect on the total number of eggs produced during the experimental period of about two years or during the first laying year. The time required to start moulting refers to the number of weeks between the time the observations were begun and the appearance of pinfeathers on the neck and breast of the bird.

Some apparent discrepancies between the results herein reported and the findings of other investigators may be due to the fact that the term "moult" as used in such studies has usually referred only to the moult of primary wing feathers.

*Is there an egg-laying type of the domestic fowl?* M. A. Jull, J. P. Quinn and A. B. Godefrey, Poultry Science, 12, 1933, No. 3, pp. 153-162.

In an effort to determine whether there is any significant relationship between the so-called type of laying birds and their laying ability, a number of live bird measurements, carcass measurements, and bone measurements of dead birds were made by the U.S.D.A. Bureau of Animal Industry. The data were secured from flocks of White Leghorns and Rhode Island Reds.

The live bird measurements were not reliable indexes of the shape or type of bird. Such measurements as length, breadth, and depth of head, length and breadth of back, greatest width at shoulders, and depth of body in front when taken on live birds were of no value in selecting for laying ability.

The dressed carcass measurements were not highly correlated with comparable bone measurements and could not be considered reliable indexes of egg-laying ability. No significant relationship was found between length, breadth, or shape of kull and egg production, total weight of eggs laid, or mean weight of eggs. Both the simple correlation coefficients and the multiple correlation between egg production and the bone measurements, length of back, width of back from femur joint to femur joint, and length of keel, were not significant. The same was true

of multiple correlations between these measurements and total egg weight or mean egg weight per bird. The evidence indicated that the type of bird, as influenced by the skeletal structure, had no significant relationship to egg-producing ability.

*Is it possible to stimulate the sexual development in poultry by the so called gonadotropic substances?* Dr. J. Kríženecký a Dr. L. F. Kameníček. *Vestník československé Akademie Zemedelske*, Vol. 9, p. 539.

From these experiments we conclude: Although the gonadotropic substances contained in the urine of the pregnant women had no improving effect on retarded development of the ovaries (the pullets even in the age of 9 month did not lay although they had not increased the weightgrowth of testicles, yet they had a stimulating effect upon internal secretions of the sexual glands, which they heightened. It is caused by the stimulating effect upon the growth of combs and wattles which although not great, was, however, considerable. In those cases where at higher doses no such effect was obtained or where it was probably due to unfavorable effect of other substances of gravid urine upon vital processes of the growing pullets.

The unfavorable activity appears as the cause of the inhibiting effect upon the growth (which manifests itself in cockerels or increases in pullets) at higher doses. The obvious increase in endocrine activity of sexual gland is particularly clearly manifested in the effects on growth of spurs: inhibiting activity in the pullets clearly proves, that the normal suppressing function of ovaries upon the growth of those organs was strengthened.

Therefore we think, that gonadotropic substances, produced in the urine of pregnant women are not so ineffective upon the development of the sexual glands in the poultry, as it would appear from the experiments up to the present day. The question is how to isolate these substances in a most active form and separate them from all impurities which act — as it was demonstrated — deleteriously upon all vital processes of the young animals (depression of the weightgrowth).

For wide practical use there is one more requirement: to prepare preparations which could be administered perorally, as the injections cannot be done by practical breeders. It is also necessary to state all other conditions of effectual use (age, the time of administration etc.) as well as all eventual later effects.

*Recessivity of red pigment in presence of ovary. Recessivité en Présence de l'Ovaire, du Pigment rouge de la Race Rhode Island dans le Croisement de cette Race avec la Race Andalou bleu.* F. Caridroit and V. Régnier, *Comptes rendus de la Société de Biologie*, Vol. 115, 1934, p. 371.

When crossing Rhode Island Reds with Blue Andalusians, the cocks have red and blue feathers, whilst the hens are only blue. Sexual inversion makes the red disappear from the feathers of the cock, and reversing, the blue hens get red and blue feathers by sexual inversion. The ovarian hormone influences thus the domination of the racial-pigments. In the presence of the ovary blue becomes dominant and red recessive.

*A new case of recessivity of red pigment caused by the ovarian Hormone. Nouveau Cas de Récessivité du Pigment rouge d'origine Rhode Island sous l'influence de l'Hormone ovarienne.* F. Caridroit and V. Régnier, *Comptes rendus de la Société de Biologie*, Vol. 115, 1934, p. 596.

In a cock which displayed a red colour and black barring in the feathers, ovaries were transplanted. The newly formed feathers did contain no more red pigment. The barred factor had extended itself over all the feathers.

*Crossing between brown Leghorn male and coucou de malines hen. Étude du Croisement entre les Races de Poules: Leghorn doré et coucou de Malines.* V. Régnier, *Comptes rendus de la Société de Biologie*, Vol. 115, 1934, p. 1671.

1. In some of the hens white shanks will appear.
2. The colour of the cocks is always of a mosaic pattern. Barred colouring does not appear in the hens. There are two patterns of female feathers. With some of them a black colour can be noticed.

*Feather colours of crossings between brown Leghorn cockerels and coucou de malines hens. Analyse expérimentale du Plumage des Métississus du Croisement entre les Races de Poules: Leghorn doré et coucou de Malines.* V. Régnier, *Comptes rendus de la Société de Biologie*, Vol. 117, 1934, p. 8.

1. The barred factor is inherited sex-linked.
2. The black colour seems to belong to the Leghorn race of a neutral form. This is a case of sex-linked inheritance, which is camouflaged by the ovarian hormone, as it has been described also by Caridroit.
3. In the cocks the barred factor will become dominant in the presence of the ovarian hormone.

*Crossings between white Leghorn and Faverolles. Die Legeleistung von Bastarden zwischen weißen, einfachkämmigen Leghorns und Lachshühnern.* Prof. Dr. W. Zorn and Dr. H. F. Krallinger, *Archiv für Geflügelkunde*, Vol. 8, p. 250.

**Summary:**

1. Crossing experiments with Leghorns and Faverolles were carried out in 1931 and 1932 in which were examined the utilizability of the F<sub>1</sub> bastards as to their egg-laying capacity and their attendant health in comparison with the parent races and back-crossing generations from both sides. The weight of six months' hens was tested.
2. Faverolles are more sensitive, more mortal birds of lower average capacity than Leghorns, but weigh about a pound more at the end of six months.
3. The F<sub>1</sub> generation stands between the two pure races both as to mortality as well as number of eggs laid yearly, yearly weight and net financial yield from eggs. The six months' weight is equal to that of the heavier Faverolles.
4. The F<sub>1</sub> generation, accordingly, shows no sign of change.
5. The results of the determinations of bodily weight are explained

by the acceptance of a few factors, the dominant one determining the greater bodily weight.

6. The mortality and egg-cupput do not allow of a factorial representation (cannot be given in statistical terms) from the material available.

7. The results show a fairly strong, genotypical equalization in the parent races so that, in connexion with the results of other investigators with utility crossings, the practice is advised, first to undertake a further intensification of the pure breeding before utility crossings between different races can be proceeded with enough certainty of success.

Hybrid vigor and uniformity are to be expected in an  $F_1$  generation only when the parent races are homozygous to a high degree.

### *Crossing Exhibition and Production Rhode Island Reds.*

How to combine exhibition and production quality in the same individual is a problem confronting many breeders, especially those who are keeping particolored varieties. An experiment recently reported from the Massachusetts Agricultural Experiment Station was planned to find out something about what would happen when a high-quality exhibition strain was crossed with the production-bred Rhode Island Reds which the Station had developed.

According to Dr. F. A. Hays, who carried on the work and prepared the report for publication, the data indicate that early sexual maturity behaves as a dominant in crosses between early-maturing production-bred and late-maturing exhibition-bred Rhode Island Reds.

High intensity and winter pause also behaved as dominant traits. Broodiness was increased by crossing, probably by the introduction of one of the essential complementary genes from each strain.

The inheritance of persistency was not so clear, because there was an excess of non-persistent daughters over the number expected on the basis of this character being a simple dominant.

Annual egg records were lower in the  $F_1$  daughters than in the production-bred strain. Egg weight at mature body weight was greater for the  $F_2$  pullets than for the  $F_1$  pullets. The study is being continued.

*Linkage Tests in Poultry.* W. Landauer. 1933. Journ. Heredity. 24, 283-294. Ref. Scottish Journal of agriculture, Vol. 17, 1934, p. 232.

The author produces data which suggest the existence of linkage between the genes of rumplessness and frizzled plumage. He has been able to obtain no evidence that there is any linkage of the genes for rumplessness and crest.

*Some sex-linked crosses.* R. T. Parkhurst, H. M. Molyneux, B. Chamberlin, and F. H. Jones, National Institute of Poultry Husbandry, Newport, Shropshire, England. Poultry Science, Vol. 12, p. 318.

Two crosses were made to test the sex-linked shank factor. A White Bresse cockerel was mated with White Leghorn hens and the colour of the shanks of the chicks was observed. A second cross was made between a Black Minorca cockerel with White Leghorn hens. The differences between the colour of the shanks in male and female chicks was not always distinct and not sufficiently accurate to be of economic value.

Two crosses were used to study the sex-linked barring factor.

A Leghorn cockerel was crossed with Barred Plymouth Rock hens, and a Black Leghorn male was crossed with Cuckoo Leghorn hens. With the first cross, in every case of sex determination at hatching, the sex was substantiated on re-examination later. Two matings were made between the Black Leghorn males and the Cuckoo Leghorn hens in subsequent years. Some mismarked chicks appeared and about 85 to 90 per cent. accuracy was obtained when using the head colour. No relation was found between the shank colour and the sex of the chicks, but a valuable discovery was made in connection with beak colour. The accuracy obtained with the beak colour was 91.47 per cent. with the males and 94.21 per cent. with the females. Beak colour is a sex-linked factor and of as much value as head colour in sexing the chickens at hatching.

To test the sex-linked rate of feathering factor, Cuckoo Leghorn cockerels were mated with R. I. Red hens. The flight feathers were used for sexing the chicks at hatching. This method showed possibilities.

A study of the sex-linked silver factor within the Sussex breed was made by crossing the brown with the light variety. The same factor was studied by means of a cross between R. I. Reds and the Light Sussex. Both these crosses gave 100 per cent. accuracy in sex determination.

This study showed that the use of shank colour for sex determination was not of economic value; that no difficulty was experienced in accurately determining sex at hatching with gold and silver matings; and that the barring and rate of feathering factors can be used, provided the females are pure for the sex-linked factor involved. A new sex-linked factor, beak colour, is reported.

*The inheritance of sexual maturity, and rate and persistence of laying.* M. A. Jull, Bureau of Animal Industry, U. S. Department of Agriculture, Washington, D. C. Poultry Science, Vol. 12, p. 318.

The 733 R. I. Red pullets were produced by 189 dams, which together with the sire's dams had each laid 200 or more eggs during their first laying year, and the 761 White Leghorn pullets were produced by 161 dams, which together with the sire's dams had each laid 225 or more eggs during their first laying year.

From the standpoint of the inheritance of the three characters, sexual maturity, rate, and persistence of laying, in both breeds it was found that on the average the daughters commenced laying later in life, laid at a slower rate, and were less persistent layers than their dams. All of the correlation coefficients are positive but low in value and not significant.

When the dams, in each breed, were divided into eight groups, according to whether or not they were above or below the mean of each of the three characters for all dams used in each breed, it was found that the mean egg production of the daughters of each of the eight groups of dams varied considerably among themselves and that the results secured from the two breeds were not consistent.

When the data were further treated from the standpoint of eliminating the influence of the male, it was found that in each breed there was little evidence to show that the dams differed materially in their ability to transmit any one of the three characters.

The only conclusion possible in the case of the data pertaining to the two flocks in question is that the dams, selected on the basis men-

tioned previously, were relatively a homogeneous group and that the three characters studied are each apparently affected by a relatively large number of genes, some of which probably influence all three characters.

*The inheritance of broodiness in Cross-bred Poultry.* E. Roberts and L. E. Card, Illinois Agricultural Experiment Station, Urbana. *Poultry Science*, Vol. 12, p. 318.

The inheritance of broodiness was studied in a cross between Dark Cornish and White Leghorns, involving a total of 655 hens. Records were obtained on 135 pure Cornish, 144 pure Leghorns, 133 F<sub>1</sub> females from reciprocal crosses, 137 F<sub>2</sub> females, and 106 backcross females.

In the Cornish stock, 90 per cent. of the females went broody one or more times, while among the Leghorns only 4 per cent. went broody. The average number of broody periods per year for the hens that went broody was 3.5 for the Cornish and 2.0 for the Leghorns.

Among the F<sub>1</sub> females from Cornish males the percentage of broodiness was 88, and the average number of times broody per year for all broody hens was 3.7. The corresponding figures for F<sub>1</sub> females from the reciprocal cross were 37 per cent. and 2.1 times broody.

These results clearly indicate the presence of at least one sex-linked gene for broodiness in the Cornish males. On this hypothesis the Leghorn males do not contain sex-linked genes for broodiness, and therefore their F<sub>1</sub> daughters do not exhibit broodiness to such a high degree when measured either by the number going broody or the number of broody periods per year.

*Relationship between age fecundity and hatchability.* J. H. Martin & W. M. Insko, Jr., University of Kentucky, Lexington. *Poultry Science*, Vol. 12, p. 318.

Fertility, hatchability, and production records of S. C. White Leghorn hens are given. These hens were selected on the basis of production, hatchability, egg size, vigour, and freedom from disqualifications. The minimum record for hens used in this test was 200 eggs in the pullet year and 450 eggs in the first three years. Most of the birds exceeded considerably these minimum requirements. Pullet hatching records are not available since no eggs were set until the yearling year. The records are given in the following table:

Age	No. hens	No. eggs set	Fertility	Hatch	Hatchability	Chicks per hen
			%	%	%	
2	159	5,892	89.1	58.6	65.8	21.7
3	99	3,408	86.8	50.8	58.5	17.5
4	84	2,292	77.4	46.5	60.1	12.8
5	60	1,097	85.1	56.7	68.2	10.3
6	39	707	77.8	57.6	74.0	10.4
7	11	220	85.0	58.6	60.0	11.7
8	3	45	62.8	51.2	81.5	7.3

While there was a trend toward lower egg records as age increased, yet in no case did the average production drop below 100 eggs. The three 8-year-old hens averaged 103.3 eggs in their seventh year and the eleven 7-year-old hens 118.3 eggs in their sixth year.



*Some genetic aspects of hatchability.* T. C. Byerly, C. W. Knox, M. A. Jull, U. S. Department of Agriculture, Washington, D. C. Poultry Science, Vol. 12, p. 318.

Data on the time and relative frequency of embryo mortality in eggs from inbred and outbred matings within breeds, crosses between crosses, matings among  $F_1$  individuals from crosses between breeds, reciprocal back-crosses of  $F_1$  individuals to individuals of the parental breeds, and matings of  $F_1$  individuals to individuals of unrelated breeds support the following conclusions:

A large number of genetic factors affect the hatchability of hen's eggs. Some affect the embryo directly, others indirectly through effects on shell or interior egg quality.

Inbreeding is likely to increase mortality very greatly during the last three days of incubation. Crossing breeds reduces the mortality during this period to a minimum determined by environmental conditions. Mortality during the first week of incubation may be somewhat increased by inbreeding, but is likely to be little affected by crossing breeds. Crossing breeds will improve hatchability only if the hatchability of eggs from matings within those breeds is below the limit set by their environment and their genetic constitution, in a strict sense. Embryos in eggs from  $F_1$  females are likely to show lower first-week mortality than that characteristic of the parental breeds or the crosses between those breeds.

*Some Experiments with Hybrids.* D. C. Warren, New England, Poultryman, May 15, 1934.

**Summary:**

1. Crosses between the S. C. White Leghorn and Jersey Black Giant showed the resulting hybrids to be superior to the two pure breeds in all measurements of vigor.

2. The results from the S. C. White Leghorn, S. C. Rhode Island Red cross showed the hybrids to be generally superior to the pure breeds of the two breeds involved.

3. The crosses of S. C. White Leghorns by Barred Plymouth Rocks and of S. C. Rhode Island Reds by B. Plymouth Rocks produced hybrids that in each case were superior to the pure breeds involved, for chick mortality and rate of growth, these being the only criteria of vigor considered.

4. Crosses between independently bred strains of S. C. White Leghorns produced offspring that were in some respects superior to the pure strain progeny, but the degree of stimulation did not appear to be so great as in the crosses of different breeds.

5. Sex of chicks may be distinguished at hatching by means of sexlinked down colors in crossbred chicks.

6. The new method utilizing the growth of wing feathers at hatching is slightly less accurate for identifying the sexes, but has certain advantages over the down-color method.

7. The advantages of the wing feather growth methods are that it makes available the W. Leghorn breed, which is widely popular and well bred for production; it produces a white hybrid, and greatly extends the list of breeds available for crossing to distinguish sex at hatching.

8. The superior vigor of some hybrids probably makes them more economical than most pure breeds for the poultryman whose major income is from marketpoultry and eggs.

*Mortality in the Egg.* F. B. Hutt and A. M. Pilkey. 1934. *Poultry Science*, 13, 1-13.

Malpositions of the embryos of chickens in eggs which were late hatched were examined. Six different malpositions were discovered and these are detailed. The question was reviewed in relation to the position of the egg in the incubator. The results suggest that there are stages of incubation when it is advantageous to have the eggs with the large ends up, and others when the horizontal position is preferable. Incubating with the large end up until the twelfth or fourteenth day should reduce the frequency of one of the malpositions. Thereafter the advantage would appear to lie with the horizontal eggs if three other malpositions are to be kept at a minimum. It would mean that the eggs would be turned in one plane for the first two weeks of incubation and in another during the last four days of turning. The writers state that it is probable that the lower embryonic mortality observed by several investigators when eggs were turned four to six times daily, compared with that resulting when eggs were turned only twice, may be to some extent associated with the lowered frequency of malpositions.

There are a lot of other interesting points raised in this paper.

*Some Abnormalities of Dead-in-Shell.* H. P. Hale, National Institute of Poultry Industry, Newport, Salop, England, Leaflet No. 15, Aug., 1930.

**Summary:**

1. Approximately 40 percent of the dead-in-shell examined were in a normal position, but their inability to emerge from the shell successfully cannot be explained with the present knowledge of so few factors.
2. Those positions in which the chick was unable to use the air-cell were responsible for approximately 35 percent of the unhatched.
3. Conditions resulting in ruptured yolk sacs are responsible for 18 percent of the dead-in-shell.
4. No appreciable difference was noted between the frequency of the abnormalities in early and late hatches.
5. There was no observed relationship existing between the thickness of shell and the malpositioned embryos in the limited number of eggs examined.
6. The results indicate that methods of turning or handling of eggs during incubation require extensive experimental investigation.

*The Development of the Chick Embryo.* Dr. A. L. Romanoff, U. S. Egg and Poultry Magazine, May, 1930.

*Changes in pH of Albumen and Yolk in the Course of Embryonic Development under natural and artificial Incubation.*

**Summary:**

1. In the course of embryonic development the pH values of albumen and yolk go through definite changes, presumably affected by natural metabolic processes occurring within an egg.
2. It was found that the changes in pH either of albumen or of yolk were similar under natural and artificial (laboratory) methods of incubation.
3. The pH of egg albumen rapidly changed towards alkalinity and back during the first week of incubation, reaching the highest point of alkalinity at about 48 hours. For the rest of the incubation period it gradually moved towards neutrality.

4. The pH of egg yolk gradually changed throughout the incubation period from acid to alkaline, with a sudden temporary drop at the sixteenth day.

*Effect of Humidity on the Growth, Calcium Metabolism, and Mortality of the Chick Embryo.*

**Summary:**

1. High humidity favored the growth and the calcium metabolism. On the other hand, it caused a heavy mortality just before hatching.
2. Low humidity retarded the growth and the calcium metabolism and showed hardly any effect on the mortality.

*Study of the physical Properties of the Hen's Eggshell in Relation to the Function of Shell-Secretory Glands.*

**Summary:**

1. The data from 3,998 eggs show that the breaking strength and the thickness of eggshell are in the average 4.46 kilograms and 0.511 millimeters.
2. There exists a positive relation between the breaking strength and the thickness of an eggshell.
3. The breaking strength and the thickness of eggshell vary with individuals.
4. The variation of breaking strength and thickness of eggshell is the least at the time of heavy egg production. Therefore, the mean value of either the breaking strength or the thickness of eggshell may be easily determined by a few observations during the cycle of heavy egg production.
5. The porosity varies with the breaking strength and thickness of eggshell. The pores of the thick shell are small and numerous, while those of the thin shell are large and few in number.
6. The physical properties of eggshell presumably depend upon the individual function of the secretory glands during egg formation more than any other external factors.

*Study of the Heart Beat of Chick Embryo.*

**Summary:**

The results of these experiments definitely show that the heart beat of the chick embryo is not constant during the incubation—it was increasing up to 8 days and then remained somewhat even for the rest of the incubation period.

**Scientific Incubation.** Alexis L. Romanoff, Laboratory of Experimental Embryology, Cornell University Experiment Station, U. S. A. Lecture, delivered at the Third Annual Incubation School, Ithaca, N. Y., November 14-16, 1933.

*I. Hatchable Egg Quality and the Factors Which Determine It.*

In concluding this discussion, I would like you practical men to notice that it is very important to know all the factors which determine the quality of a hatchable egg. By knowing these factors, we may lessen or perhaps eliminate the influence of one factor after another and in this way add materially to the general improvements of our modern practices of artificial incubation.

*II. External Factors Determining the Development of the Bird.*

**Conclusion:**

In concluding my present lecture, I may say that in our ordinary practice of artificial incubation we can hardly talk in terms of the

influence of one of the physical factors of incubation, either on the growth of the embryo, or on the distribution of embryonic mortality, or on the hatchability of eggs, or on the survival of brooded birds. In many cases, there is more than one physical factor responsible for our unsatisfactory hatch. But, there are always some ways and means by which we can tell what are the most troublesome factors. The extensive experimental study along the lines described above will be the main source of information as to what is wrong and how to correct it, and how to prevent further failures and to assure continuous progress. By progress here I mean the hatching of stronger, healthier, and more productive birds.

### III. Air in the Incubator Room.

#### Conclusion:

In conclusion, I may say that by solving the problem of proper ventilation of our incubator room, we solve a part of our incubation problem towards: (1) the normal growth of embryo in abundance of oxygen and low content of carbon dioxide; (2) the possibilities of getting uniform and better hatches; and (3) preventing the spreading of diseases from eggs to hatched birds.

### *Biochemistry and biophysics of the developing hen's egg. —*

#### II. Influence of composition of air. A. L. and A. J. Romanoff, Cornell Sta. Mem. 150, 1933.

Continuing this investigation, a study was made of the influence of various compositions of air, particularly in respect to the content of oxygen and carbon dioxide, on the successive stages of the growth, development, and mortality of chick embryos, and also on the pH of egg albumen and yolk. Eggs from a commercial flock of White Leghorn hens were used. The eggs were incubated in a special electric laboratory incubator in which the amount of CO<sub>2</sub> was admitted in the following amounts: 0.4, 1, 6, 10, 14, 18, and 22 percent.

The results indicated that the unbalanced composition of the air had both a direct and indirect influence on the development of the embryo. Under the direct influence it was found that the growth of the embryo during the first few days of incubation was apparently stimulated by a moderate amount of CO<sub>2</sub>. A large amount of CO<sub>2</sub> with a reduced amount of oxygen retarded growth in direct proportion to the amount of CO<sub>2</sub> present. The embryo at this stage was more sensitive to unbalanced air conditions than at later stages. The mortality of the embryo during the early part of incubation was greatly increased by either low or high concentrations of CO<sub>2</sub>. The abnormalities within the egg were mostly various malpositions of the embryo.

Among the indirect influences was observed a great change in the pH of the egg constituents, particularly of the albumen. The pH of the albumen during the first week of embryonic growth was in direct relationship to the amount of CO<sub>2</sub> in the incubator. This relationship could be expressed mathematically, using the empirical formula:

$$y = 7.83 + \frac{(2.945 - 0.25x)}{(1.3x + 1.69)} (\sin 30z - 0.5 \sin 60z),$$

in which y is the pH of egg albumen, x the CO<sub>2</sub> concentration, and z age of embryo in days. This relationship between CO<sub>2</sub> concentration and pH of egg albumen is suggested as a method for testing the reliability of incubators and the efficiency of hatching.

*Internal Factors Influencing the Mortality of the Chick Embryo.*  
A. L. Romanoff, V. S. Egg and Poultry Magazine, Jan.,  
1933, p. 42.

**Summary:**

1. Some eggs do not hatch because they are either naturally unfit for hatching or are destroyed by their environment in the course of embryonic development.

2. The quality, or physicochemical constitution, of eggs used for hatching is determined chiefly by heredity and by the physical condition of the hen. That is, certain characteristics are transmitted from generation to generation, while others are acquired only at the time of egg formation.

3. The environment of the eggs from the time they are gathered to the time of hatching influences the growth and the vitality of the embryo. The embryonic death rate, particularly at hatching time, is determined largely by the incubation environment.

4. In general, the causes of embryonic mortality are very complex and uncertain. In the practice of incubation it would be hard to attribute the mortality to any one factor alone. It is likely that in most instances several factors have a combined influence.

**Practical Suggestions:**

In order to avoid either heavy losses from unhatchable eggs or the disappointment of having a poor stock, it is well to keep in mind the following suggestions:

1. Use eggs for hatching from the best flock of hens. The hens must be healthy, vigorous, good producers, and layers of good quality, hatchable eggs.

2. Select for hatching eggs that are uniform in size, shape, and color and of good shell texture, because all of these egg qualities are transmissible to a new generation.

3. Do not wash the eggs, because washing may destroy the cuticle, which serves as a protection from penetration by harmful microorganisms, particularly in a dusty incubator.

4. Keep the eggs for only a reasonable length of time, and protect them from dust, strong odors, dry or humid air, extremely high or freezing temperatures. Improper temperature, especially, may kill the embryo before incubation.

5. Choose a reliable incubator, proved by the experience of successful users.

6. Keep the incubator clean, sanitary, and free from dust, in order to protect the eggs from infection.

7. Avoid extreme variations in incubation temperature. High temperature has a tendency to weaken the embryo; low temperature, to retard the growth of the embryo.

8. Watch for humidity condition in the incubator. Humidity regulates evaporation of moisture from the eggs. On the other hand, the combined action of high temperature and high humidity may produce heavy embryonic mortality, particularly at the time of hatching.

*Effect of temperature on the growth, fat and calcium metabolism, and mortality of the chick embryo during the latter part of incubation.* A. L. Romanoff and H. A. Faber. Journ.

Cell. and Compar. Physiol., 2, 1933, No. 4, pp. 457-466.  
(Ref. Exp. State Record, Vol. 70, 1934, p. 226.)

The New York Cornell Experiment Station made a study of the influence of temperature on the developing chick embryo during the latter part of incubation. Eggs from White Leghorn hens were incubated under the usual environmental conditions up to the sixteenth day of embryonic age. After this period hatching proceeded with a relative humidity of  $60 \pm 1$  percent, the carbon dioxide was gradually increased to a maximum of 0.7 percent, and the temperature was varied in each test as follows: 40°, 38°, 36°, 34°, and 32° C.

At 40° the growth of the embryo was first accelerated and then completely arrested, but the life of some of the embryos was maintained up to complete hatching. At 32° growth was slightly retarded. The rate of utilization of yolk and albumin was slow at the high temperature and rapid at the low temperature, with the albumin completely disappearing at 18 days. Neither high nor low temperature had a marked influence on either fat or calcium metabolism. At the high temperature the mortality of the embryos was very heavy from the beginning to the end, but at the low temperature there was a gradual decrease in mortality. Hatching occurred one half day or so earlier at high temperature and was irregular and delayed about two days at low temperature. During the latter part of incubation a temperature of from 36° to 34° was found to be the most efficient for the growth, metabolism, survival, and natural vitality of the chick embryo.

*The Blood Formation and the Copper Content of the Chicken Embryo.* S. Sumegi, Arch. Path., Vol. 17, 1934, p. 246.

The copper content of chick embryos during incubation increases gradually up to the time of the onset of respiration. Beginning from the onset of respiration, the copper content increases more rapidly. The number of red blood cells and their hemoglobin content are in direct proportion to the copper content of the embryo. The morphologic maturity of the blood cells is almost in direct proportion to the copper content. Twenty-four hours after the chicken is hatched, the copper reserve is markedly diminished.

*Vitamine C in the embryo of the chick. Vitamine C in het Kuikenembryo.* Surendra Nath Ray, Biochemical Journal 28, 189-191, 1934.

Herein has been established that no vitamine C was present in the new laid egg, whilst a fairly large quantity is already present 4 days after hatching. The injection of watery vitamine C extracts in the egg did not bring any change about in the growing speed of the embryo. As it is observed in germination of seeds, vitamine C is also produced in this case during the process of development of the embryo.

*Pathological Phenomena of the Embryo during artificial Incubation. Material zum Studium pathologischer Vorgänge bei der embryonalen Entwicklung des Hühnchens während der künstlichen Bebrütung.* Prof. E. Penjonschkewitsch, Archiv für Geflügelkunde, Vol. 8, p. 197.

**Summary:**

1. The variation of one of the basic factors of artificial hatching which we have studied, (temperature and dampness), in the sense of an

increase or reduction, causes a disturbance in the development of the embryos, which, with haematological researches, manifests itself in the course of the embryonic growth and when chickens come out of their shells.

2. The failure to keep the optimum of one of the above-mentioned factors is accompanied by specific phenomena which are characteristic of every kind of variation and peculiar to every case.

3. On the basis of the experiments carried out, it may be said that a detailed study of the pathological phenomena of embryonic growth which manifest themselves during the hatching process, and when the chickens come out of their shells, and are dependent upon not keeping to individual factors of the hatching technique, the basis of a new hatching discipline — of "hatching diagnostics" — must be formed, which will play a great part in the fight with the losses from artificial incubation.

4. An influence of the individual, technical hatching factors on the quantity of the haemoglobin with the embryos can definitely be ascertained, and it is possible to use these data for the clearing up of wrong hatching conditions, and, in this way, to exercise a control of the hatching technique. For the ascertainment, however, of definite limits within which the haemoglobin may fluctuate in consequence of disturbed conditions of the hatching technique, all possible individual variations with the optimum hatching technique must be avoided.

### *More about the Chick Embryo. Continuation of Report of Investigations at Cornell University. V. S. Egg and Poultry Magazine, June, 1930.*

#### **Summary:**

It has been found that under standardized conditions of artificial incubation it is possible to obtain regular curves of the natural embryonic growth and metabolic changes in the embryo and in egg-contents.

1. The embryonic growth curve was found to be very regular, with but a slight indication of the invariably present growthcycles.

2. The curves of the dry matter, total ash and calcium content of the embryo were found to be also very regular, and closely following the growth curve.

3. The curves of the percentages (a) of dry matter in wet-weight, (b) of total ash in wet-weight and in dry matter, and (c) of calcium in wet-weight, in dry matter and in total ash, were found to be regular, but quite distinct in each case.

4. The curves for the physico-chemical changes in eggs were found to be regular and distinct, particularly in the loss of weight by eggs and in the percentages of dry matter in yolk, albumen and eggshell.

### *The effect of age and holding temperatures on hatchability of turkey and chicken eggs. H. M. Scott, Poultry Science, 12, 1933, No. 1, pp. 49-54.*

A series of experiments was undertaken at the Kansas Experiment Station to determine the effect of age at setting and the influence of the temperature during the holding period on fertile eggs of Bronze turkeys and White Leghorn chickens.

The hatchability of the Leghorn eggs was not materially reduced until after the sixth day by holding at a mean temperature of  $36.3^{\circ} \pm 0.2^{\circ}$  F. The turkey embryos were not injured to the same extent as were the chick embryos under the same conditions. Holding Leghorn eggs for

from 21 to 34 days at a mean temperature of  $54.2^{\circ} \pm 0.26^{\circ}$  gave a higher hatchability than is usually reported for eggs of this age. Turkey eggs under the same conditions hatched well from the first to the thirty-fourth day. When eggs were held at temperatures near or above the physiological zero ( $60^{\circ}$  to  $75^{\circ}$ ) for prolonged periods or at the rather low temperature of  $36.3^{\circ}$ , many embryos died during the first few days of incubation.

*Relation of ventilation in an electric brooder to health and growth of chicks.* J. E. Dougherty and B. D. Moses, Poultry Science, 12, 1933, No. 2, pp. 141-143.

The results of 11 trials with electric brooders at the California Experiment Station showed that the development of dampness in the brooder preceded serious contamination of the air by a rather wide margin. Circulating air at the rate of 1 cu. ft. per 100 chicks per minute was not rapid enough to prevent excessive condensation of moisture or to meet the needs of the chicks up to 6 weeks of age. While a rate of circulation of 2 cu. ft. per 100 chicks per minute met the requirements of the chicks, it was not enough to keep the hover dry after the chicks were 3 weeks old. As much as 4 cu. ft. of air would not keep the hover entirely dry until the chicks were 6 weeks of age. When the ventilation was so regulated as to keep the hover reasonably dry, the chicks themselves received ample air. Excessive ventilation had no beneficial effect on the chicks, caused an undue dissipation of heat, and greatly increased the consumption of electricity.

*Relation of time of laying and embryonic mortality.* C. Nicolaides, Poultry Science, 12, 1933, No. 4, pp. 274-276.

At the Massachusetts Experiment Station a study was carried out to measure the effect of time of laying upon embryonic mortality on the individual bird basis. No significant difference was found in the rate of embryonic mortality between eggs laid at different periods of the day. The greatest difference in this respect, and the difference was not statistically significant, occurred between eggs laid from 9 a.m. to 12 m. and those laid after 2 p.m. Cytological studies indicated that the blastoderms of eggs laid by high-hatching hens were further advanced at laying time, regardless of the time of laying, than those laid by hens of low hatchability.

*Time at manner of determination of the malposition head-in-small-end-of-egg.* T. C. Byerly and M. W. Olsen, Poultry Science, 12, 1933, No. 4, pp. 261-265, fig. 1.

This study by the U.S.D.A. Bureau of Animal Industry was designed to obtain information concerning the time of determination of the malposition head-in-small-end-of-egg and the mechanism of its determination and at the same time to gather data on the lethal effect of this malposition. Several lots of eggs were incubated for different periods with small-end-up, large-end-up, or horizontally and then changed to one of these positions other than the initial one.

The malposition head-in-small-end-of-egg was usually determined during the second week of incubation. The adhesion of the allantois to the shell membrane was an important factor in restricting the movement



of the embryo and probably partially fixed the hatching position. Embryos in the normal position had more than twice the chance of hatching as embryos with head-in-small-end-of-egg.

*Effect of multiple turning upon growth of chick embryos.* Thomas B. Clark, West Virginia Experiment Station, Morgantown. Poultry Science, Vol. 12, No. 5.

Chick embryos were weighed on the ninety-sixth hour and every 72 hours thereafter up to and including the nineteenth day of incubation.

A significant difference in favour of multiple turning was found between the average wet weights of nine embryos turned six times daily and nine embryos turned twice daily on the seventh and tenth days.

Multiple turning had no apparent cumulative effect upon embryonic growth in the second half of the incubation period.

*Effect of frequent turning on hatchability and distribution of embryo mortality.* W. M. Insko, Jr., and J. Holmes Martin, Kentucky Agricultural Experiment Station, Lexington. Poultry Science, Vol. 12, No. 5.

1. When eggs were set in a forced-draught incubator there was a direct relationship between the number of times the eggs were turned and the hatchability of the eggs.

2. When eggs were set in a sectional type incubator in every case the percentage hatch of total eggs set and fertile eggs set was greater when the eggs were turned 4 times than when turned 2 times.

3. There was a decided tendency toward the decrease of embryo mortality during the first three days of incubation as the number of turnings increased. Frequent turning seemed to have little or no effect upon mortality from the 4th to the 18th days of incubation. During the remainder of the incubation period there was a slight reduction in mortality as the number of turnings increased.

4. An increased number of turnings tended to lower the percentage of malpositions.

*The costs of Rearing Chicks. Il costo del Pollo dalla Incubazione a tre Mesi di Eta secondo i Dati del Pollaio sperimentale del R. Istituto Superiore Agrario di Milano.* Clinica Veterinaria, Vol. 56, 1933, p. 865.

The costs for rearing of artificially hatched chicks were about the half higher than those of young hens which were offered on the market. The experiment concerned here 100 young hens.

*Scientific and modern chick rearing and battery brooding.* M. J. Rowlands, London, Poultry World Ltd., 1932.

This treatise, based on the experience of the author and on the practical knowledge of poultry farmers, is designed as a handbook on chicken rearing and battery brooding. Information is given on the process of digestion, foods and their functions, management of battery brooders, coccidiosis and other diseases to which chickens are prone, and the prevention or cure of these diseases.

*Chick brooding, feeding, and management.* W. C. Tully, South Dakota Sta. Circ., 15, 1934.

Starting and growing rations that have been tested and found satisfactory for chicks and information on chick management are presented.

*Grow Healthy Chicks.* F. E. More, Agric. College, Fargo, North Dakota, Circ. 91, Febr., 1932.

This circular first outlines six points for growing healthy chicks, as clean chicks, early hatched chicks, clean brooder house, clean ground, clean feed and clean management. Each of these six points is explained in detail.

*Rearing Results at the Northern Breeding Station, Reaseheath, England.* W. L. S. Hindaugh, The Poultry Record, May, 1934.

#### Conclusion :

It is not intended to do anything more than make the bare statement of fact that at the Northern Breeding Station there appears to have been some loss of vigour which has expressed itself as a decline in the rearability of chicks. It is hoped that these figures may be of interest to the Industry and perhaps of assistance in helping towards a solution of one of the many problems facing poultry-keepers through a realisation of what has happened in one case and under certain defined conditions in the past.

It is heartening to be in a position to report that during the present season there is so far a very definite and marked improvement in the rearability of stock, which the Northern Sub-Committee would like to think is symptomatic of the general trend of present day experience.

*Effect of confinement on the growth of chicken combs and testes.* G. D. Buckner, W. M. Insko, Jr., and J. H. Martin, Amer. Journ. Physiol., 102, 1932, p. 271.

This experiment at the Kentucky Experiment Station was designed to determine the effect on the growing chick of confinement under laboratory conditions as compared with normal farm conditions. Day-old chicks were divided into three lots of 120 birds each. Lot 1 was raised in colony brooder houses with free access to grass and direct sunlight, lot 2 was kept for 6 weeks in a hot-water-heated battery brooder and then transferred to colony brooders, while lot 3 was raised for 6 months in battery brooders.

It was found that the cockerels raised under the conditions of lot 3 developed abnormally large combs and smaller testes than those raised in colony brooders.

*Morphological study of differentiation of sex of chicks.* A. L. Romanoff, Poultry Science, 1933, p. 305.

Measurements of heads and beaks as well as some of the internal organs of more than 200 day-old chicks were made at the [New York] Cornell Experiment Station. This was done to determine whether there were distinctive bodily characters associated with the respective sexes.

The results did not show a very pronounced difference between the sexes, yet did point out distinctly that such differences were present.

The length and width of head and size of beak averaged a little larger for males than for females hatched from eggs of corresponding size. The length of intestines and the weight of gizzard and heart were also larger in males, while the length of cecum and weight of liver were slightly greater in females.

*Capons and caponizing.* C. M. Bice, Hawaii Sta. Circ. 7, 1933.

Information necessary for successful caponizing, together with suggestions on the selection of birds and their care after the operation, are presented.

*Chick suggestions.* C. S. Platt, New Jersey Stas. Hints to Poultrymen, 21, 1933-34, No. 2, p. 2.

This account gives useful suggestions on the management and feeding of chicks up to the twenty-fourth week of age.

*A Study on the Time of Laying.* T. S. T. Watson, The South African Poultry Magazine, 1934, p. 269.

**Summary:**

With the two groups of birds used in this test there is a significant tendency towards early laying in the Australorp, as compared with the Wyandotte.

Early laying is a breed character and is probably inherited.

*Egg Production — Selection by Ancestor's Yields.* M. A. Jull, 1934, Journ. Hered., 25, 61-64.

The writer is of opinion that the actual number of eggs laid by a hen and by her ancestors, as well as by the maternal ancestors of her sire, has relatively little significance in breeding for egg production. He demonstrates this by the results secured from various matings of sires and dams selected on the basis of the dam having laid a minimum of 200 eggs during the first laying year. These results came from matings of Rhode Island Red birds and the production of 701 daughters sired by 15 different cocks and out of 121 hens. These daughters were produced during three years—1928, 1929, and 1930. The hatching season each year occurred from March 17th to the first week in May. Housing conditions, the rations fed and methods of feeding were the same. Artificial light was used during the winter months.

The 121 dams were selected on the basis of having laid a minimum of 200 eggs each. Four tables give the statistical results. From these it is apparent that in this selected group there is no significant relationship between the egg production of the dams and that of their daughters. The daughters of dams whose egg production ranged from 211-220 eggs laid better than the daughters of any other class of dams. In other words a dam that laid 270 eggs would, on the average, produce daughters that would lay no better than a dam which laid 220 eggs.

As regards the sires, the main egg production of the sires' daughters does not appear in significant relation to the egg production of his dam nor of either of his grand-dams.

The author is of the opinion that when a minimum first year record of 200 eggs is used as the basis of selective breeding stock, the actual number of eggs laid by any bird does not indicate the breeding ability of that bird, nor does the egg production of the sire's dam serve as an

index of the breeding ability of the sire. Furthermore, the egg production of the three nearest female ancestors has been shown to have no significant relationship to the egg production of the progeny.

The author concludes by stating that these observations do not discount the value of pedigree breeding which involves recording the ancestry of every bird in the flock, because it is only when pedigree breeding is carried on that progeny testing can be employed in order to achieve progress through the results secured from given matings.

*Progeny testing in Poultry breeding as a means of evaluating the breeding potentiality of an individual.* M. A. Jull, American Naturalist, Vol. 67, 1933, p. 500.

The tests undertaken in the breeding of cattle, to find a useful holdfast for the forecast of the breeding value of some animals, has been re-examined on red Rhode Islands. It concerns here first rate capable breeds from different cocks, which were used during the three breeding years 1928/29—1930/31. After deduction of 9.2 % of deceased hens, 920 daughters remained, which had filled their first year of laying at an average of 192 eggs each. The conditions of support during the three test years were identical. The generally low capacity 1929 could be traced back to the use of three inferior cocks. According to the tables given, the maternal egg laying capacity was of one or hardly any importance for the capacities of the daughters, the selection according to the capacities of the mothers (groups above resp. below 200 eggs yearly capacity) remained without success. The capacity of the mother may therefore not be taken as an indication for the breeding value of the daughters. Nor does the capacity of the maternal blood-sisters give a useful point of departure. The correlation between the capacities of the mothers and daughters amounted to  $0.04 \pm 0.06$ , between the blood-sisters of the mother-hens and their daughters it was as much, therefore without importance. When pairing the same hens with different cocks considerable differences in the capacities of the daughters were also established within the two years; even daughters of the same pairing showed in the respective years just as great a difference in the capacity as those from pairings of different cocks with the same hens. An indicator of the capacity can therefore not be obtained in this manner. The same picture was shown by the daughters of blood-brothers, and in the same way considerable differences were shown in the capacities of hens from two or more blood-sisters when paired with different cocks or one cock.

*Inheritance and Improvement of Egg Production.* Sherwood, 43rd annual Report, College Station, Brazos County, Texas.

The object of this work is to test the ability of certain cockerels to transmit high egg production to their progeny and to develop high egg-laying strains by the use of such cockerels in mating with hens possessing similar qualities. Six cockerels, selected on the basis of the good egg-producing qualities of their ancestors, were used in mating to linebred hens to determine relative ability of these cockerels to transmit these qualities.

The data show the importance of the progeny test in evaluating a breeding male. Two cockerels, Nos. 114 and 132, were secured from the same breeder and from the study of their ancestors it would seem that No. 132 would be the better bird. The progeny prove that No. 114 trans-

mits higher egg production. Two other cockerels, Nos. 120 and 121, were purchased from another breeder. The ancestors of bird 121 seemed to be better than those of No. 120, but the progeny prove that No. 120 is the superior breeding bird.

*Factors Modifying Egg Production.* E. O. Whetham, Journ. Agric. Science, 1933, 23, 383.

The seasonal egg production curves throughout the world, grouped according to latitudes, are studied in relation to the seasonal variation of daylight on the corresponding latitudes. There is evidence that alterations in the light ration may affect the egg production by a stimulation of the anterior pituitary and that this increases the production of a hormone governing the production of eggs. From this standpoint the effects on egg production of artificial illumination, date of hatching, age at maturity, levels of production and breed differences have been studied.

*Genetic Studies in Poultry. IX. The Blue Egg.* R. C. Punnett. *Olive and Blue!* Journal of Genetics, Vol. 27, 1933, p. 465. Feathered World, 1934, 90, 359.

The Araucano, a Chilean fowl, lays blue eggs. The articles, titled above, deal with the mode of inheritance of this colour. The blue egg colour behaves as a simple dominant to non-blue. Combined with various shades of brown it gives a series of greens and olives, thus behaving similarly to the polychromatism characteristic of pheasants' eggs.

Brown is similarly dominant to white, but the relation is not a simple one. Two kinds of white eggs are known, one, a recessive white, and another containing a factor (I) which partially inhibits the production of brown pigment. It is this latter type of white that is responsible for the white shell of the Mediterranean races. In addition, in brown eggs there are three factors; minor factors  $T_1$  and  $T_2$ , and a major factor B. The various colour shades of white and brown eggs may be dogmatically grouped as follows for the factors present:—

White Eggs.	Neither $T_1$ nor $T_2$ nor B, whether I be present or not.
Pale Tinted.	Either $T_1$ or $T_2$ , or $IT_1T_2$ .
Pale Brown.	$T_1$ and $T_2$ , or IB, $IBT_1$ , $IBT_2$ .
Brown.	B.
Deep Brown.	$BT_1T_2$ .

As mentioned above, the blue egg acts as a simple dominant to non-blue. The addition of the blue factor to a tinted egg turns it to a green egg, the shade of olive produced depending on the depth of brown colour present. A point of interest is that the blue tint permeates throughout the thickness of the shell, whereas the brown colour is mainly deposited on the surface of the shell. From the chemical point of view, the brown colour in eggs is due to protoporphyrin, a derivative of the blood pigment, the blue colour, according to Dr. Rudolf Lemberg, is probably the so-called "banded oocyan" of Sorby.

*The Eastern Provincial Cockerel Breeding Scheme.* F. Hanley, Essex Agric. Comm. Register of Egg Records ... 1931-32.

Describes the objects of this Scheme. Details are given of the working of the Scheme followed by an account of the results obtained in the first two seasons.

*The National Institute of Poultry Husbandry duck trap nest.* V. K. Tallent and E. W. Fogden, Harper Adams Util. Poultry Journ., 18, 1932-33.

A trap nest for ducks developed at the National Poultry Institute, England, is described and illustrated in this article.

*The Marking of Ducklings by Toe Slitting.* V. K. Tallent, Report from Nat. Institute of Poultry Husbandry, Newport, Shropshire, 1932.

Description with illustrations of nine separate combinations of slits. With them it is easy to read and record any number up to 999.

*Turkey Production in North Dakota.* O. A. Barton, F. E. Moore and L. M. Roderick, Agric. College, Fargo, North Dakota, Circ. 82, March, 1932.

This publication covers the most vital factors in turkey production and includes breeding, feeding, housing, incubation, rearing, marketing and disease, parasites and sanitation.

*A case of leg-colour asymmetry in the fowl.* F. A. E. Crew, Journal of Genetics, Vol. 25, 1932, 359-365.

From a  $F_1$  hen from the crossing Light Sussex  $\times$  Rhode Island the right leg showed the dominant white, the left leg the recessive yellow. The author discusses two possibilities for the realisation of this asymmetry: 1. Somatic elimination of a chromosom. 2. Somatic mutation. The presumption has been offered, that it concerns here the loss of a part of an autosom in the course of the second part of the maturity. This also refers to six other such like cases, which have been described already earlier: also these can be regarded most probably as the consequence of the loss of a whole autosom or a part there of.

*The reaction of dominant white with Yellow and Black in the fowl.* C. H. Danforth, Journal of Heredity, Vol. 24, 1933, p. 301.

Danforth crossed white Leghorns, yellow Leghorns, black Minorcas and Jersey Giants. Dominant white is mostly capable to suppress black, whilst, on crossing with yellow it possesses only a very limited effect. Yellow in the plumage is epistatic over dominant white especially if the animal is of a homozygot yellow, the white will cease to appear. If a dominant white animal is crossed with an animal, which has black or yellow pigment, black will disappear, whilst yellow will only appear a light shade paler. Descendants of such crossings are in the most cases, in both sexes, of a clear white when chicks. On the sexual maturity becoming perfect, the hens will become yellow, the cocks yellow, red or of a bronze colour.

*Creeper and single-comb linkage in fowl.* W. Landauer, Nature, London, 132, 1933, p. 606.

Continuing the study of linkage between the genes for creeper and single comb in the fowl at the [Connecticut] Storrs Station, a total of 4,513 individuals were produced from matings of heterozygous Creeper

females with normal males, which exhibited 0.56 percent of crossing over, and 7,408 back-cross chicks exhibiting 0.39 percent of crossing over. The new data obtained in the third laying year showed no striking changes in the percentage of crossing over, and indicated that age was not a factor influencing the rate of crossing over.

*Inheritance of rate of growth in domestic fowl. — II. Genetic variation in growth of Leghorns.* V. S. Asmundson and I. M. Lerner, *Poultry Science*, 1933, pp. 250-255.

Continuing this series, the rate of growth from 2 to 8 weeks of age for 340 Single Comb White Leghorn chicks was calculated by a modified formula of Minot, employed by Brody. From the growth curves calculated, males were shown to grow more rapidly than females. Time of hatching of the chicks also influenced growth rates significantly, the differences between those produced in the first and second hatch and those produced in the third and fourth hatch being more than three times their probable errors.

The 340 birds employed in the study were the progeny of 6 different males, and there were more than 15 birds available from 3 of the males. Of the 6 families from which sufficient offspring were produced to study the inheritance of growth rate, there were 3 families with a comparatively rapid rate of growth and 1 with a relatively slow rate of growth. The differences between these groups were statistically significant and suggested that rate of growth within these strains was controlled by multiple genetic factors.

*A gene modifying frizzling in the fowl.* W. Landauer, *Journ. Heredity*, 24, 1933, p. 152.

Continuing the studies of the inheritance of frizzling in the domestic fowl at the Storrs Station, the occurrence of a recessive modifying factor is noted. This factor appeared to act as an inhibitor of frizzling which was apparently rather generally distributed in normal stocks. A ratio of 1:2:1 of normals, lowgrade Frizzles, and modified homozygous Frizzles was observed in 95 chicks from inter se matings of modified heterozygous Frizzles. A similar ratio was obtained in matings of typical heterozygous Frizzle females with homozygous Frizzle males.

*Inheritance of white spotting in ducks.* R. G. Jaap, *Poultry Science*, 12, 1933, No. 4, pp. 233-241, figs. 3.

Studies at the Wisconsin Experiment Station of the plumage pattern in ducks showed that there are genetically two factors which cause white primaries. One is recessive, designated as w, while the other is the expression of the heterozygote for the runner pattern R.

Of 26 matings of Mallards (colored primaries), 9 matings produced 2 or more ducklings with white primaries. Among these young there were 200 with colored primaries and 63 with white, which closely approached the expected 3:1 ratio in the behavior of recessive w.

Studies of the inheritance of the runner gene from a White Pekin and Mallards with white primaries were conducted in several types of matings, including back-crosses, and the results seemed to fit the hypothesis advanced. Further confirmatory data were derived from matings involving the interaction of R and w in which more than 300 ducklings were produced.

In further study of the mode of inheritance of a characteristic designated as white bib, which was described as a large white shield-shaped area occupying most of the claret breast region of Mallards, in an  $F_2$  generation of 86 individuals 65 were without and 21 had the bib. This approximated closely the 3:1 ratio. The back-cross matings produced approximately equal numbers. These results suggest the action of an autosomal recessive gene, designated as b, responsible for the presence of the white bib in the Mallard duck.

The white feathers of the true bib showed no pigment. One male, showing the white region but having the basal part of the feathers a light slate color, was tested genetically and found to differ from birds exhibiting the true bib character.

*Inheritance of Albinism in the Domestic Fowl.* D. C. Warren, 1933, Journ. Heredity, Vol. 24, 379-383. (Ref. Scottish Journal of Agriculture, Vol. 17, 1934, p. 232.)

An Albino hen is now reported for the first time. The birds are, of course, white with pink eyes. The plumage and eye colour are associated with each other, and in the matings made there was no appearance of segregation. As in other animals albinism behaves as a simple recessive to normal colour. This adds a fourth member to the series of whites in the domestic fowl, the others being the dominant white which is characteristic of the White Leghorn breed, and the two recessive whites which are independent in their action. One of these is characteristic of the Silky White Bantam, and appears to be limited to the Bantam varieties. The other is the white of the Dorking breed, and is the same factor which is responsible for the white colour of the White Plymouth Rock and the White Wyandotte.

This Albino factor is clearly expressed in a day-old chick, since the brilliant pink eye readily distinguishes the Albino from the normal, which has black eyes at hatching. The Albino, however, is not a vigorous bird, because the poor eyesight rather seriously interferes with its existence.

*Sexing baby chicks.* K. Masui and J. Hashimoto, trans. by H. Okumura, Vancouver: Jour. Ptg. Co., Ltd., 1933, p. 91, pls. 21, figs. 5. (Ref. Exp. Station Record, Vol. 70, p. 822.)

In addition to describing in minute detail the technic of sexing chicks, the treatise discusses the early history and development of sexing, the anatomy of the sexual organs of the fowl, and the structure of the cloaca and the genital eminence. The economic significance of the early separation of sexes is discussed.

*The rudimentary copulatory organ of the domestic fowl.* E. MacDonald and L. W. Taylor, Jour. Morph. and Physiol., 54, 1933, No. 3, pp. 429-449.

An account is given of the development of the rudimentary copulatory organ in 1,400 birds ranging from 4-day embryos to 12-week-old chickens. The organ was first observed in 6-day embryos of both sexes, and it continued to enlarge up to the twelfth day of embryonic life, after which the organ diminished in size in females. It was estimated that sex could be distinguished in chicks at hatching with an accuracy of about 90 percent.



*Plumage and eye color inheritance in the Single Comb Rhode Island Red fowl.* D. C. Warren and C. D. Gordon, Jour. Agr. Research, 47, 1933, p. 897.

The results of a study conducted at the Kansas Experiment Station on the genetics of variations in the standard color of plumage and eyes in the Single Comb Rhode Island Red fowl are reported. The variations in the color of the back, breast, hackle, underplumage, and flight feathers, and the eye color of more than 3,000 birds are tabulated.

The results indicated rather definitely that the plumage-color variations were hereditary, but the basis for the inheritance of these colors seemed too complicated to permit separate analyses. However, the results supported the view that multiple factors were responsible. Sexual dimorphism in the plumage-color variations was observed in that males averaged darker in color than females. No evidence of sex linkage was observed. Variation in eye color did not seem to be hereditary.

*Artificial and hereditary suppression of sacral vertebrae in the fowl.* C. H. Danforth, Soc. Expt. Biol. and Med. Proc., 30, 1932, No. 2, p. 143. (Ref. Exp. St. Record, Vol. 69, p. 788.)

Eggs were found to produce some rumpless chicks when the incubator temperature was fluctuated during the first week of incubation. Arrested growth rate at a time when the posterior part of the body should be in a state of most active differentiation seemed to be the cause of the development of rumplessness in genetically normal fowls.

*Partial sex reversal in the fowl.* F. D. Reed and C. L. Martin, Poultry Science, 12, 1933, p. 90.

In this article from the New Hampshire Experiment Station the authors describe a case of partial sex reversal in a Rhode Island Red fowl.

*Silk mutation in a hen and cock. Un cas de Mutation soyeuse chez la Poule.* Dr. Gellée, Recueil de Médecine Vétérinaire de l'Ecole d'Alfort, Vol. 110, 1934, p. 87.

In a farm for ordinary chickens, out of a batch of 15 eggs, 2 hens and one cocks were hatched having silk feathers. Both these mutations are described.

*The Survival of the Spermatozoon in the Domesticated Fowl.* A. Walton and E. O. Whetham, J. Exper. Biol. 1933, 10, 204.

Fertility in the hen persists after removal of the cock for about 15 days. Normal spermatozoa are not found in the oviduct throughout this period. Confirming Ivanoff we have shown that fertility persists after irrigation of the peritoneal cavity and oviduct with spermicidal solution. Survival of fertility after treatment persists as long as in the unoperated bird, but the number of fertile eggs laid is reduced by degeneration of ova. These results conform to Ivanoff's hypothesis that spermatozoa may penetrate the immature ova previous to ovulation, but reasons are advanced for regarding this assumption as unwarranted without further evidence.

*Three types of breeding hens.* W. C. Thompson, New Jersey Agriculture, 1933, p. 6.

In this article the author describes the characteristics of three types of hens based upon the individual weight of the eggs produced by them.

*Control of Cannibalism in Chickens.* J. S. Carver, Washington Col. Sta. Bul. 267, 1932.

The use of natural-coloured ruby lights for controlling cannibalism in brooder houses, on pullet range, in battery brooders and in fattening stations is discussed. Painting the windows of houses with a red lacquer or soluble paint was also found to give satisfactory results in the control of this habit.

*Types of Intensity in Rhode Island Reds.* F. A. Hayes and R. Sanborn, Massachusetts Sta. Bul. 286, 1932.

Continuing this study, this phase was concerned with clutch size in periods throughout the year as a measure of intensity. Data are presented to show the correlation between mean winter, mean spring, and mean summer clutch size; the relation of clutch size during these periods to four heritable characteristics affecting fecundity; the mean clutch size during March, April and May in relation to these heritable traits; and between clutch size during six intervals of time and annual production. All Rhode Island Red pullets hatched during the years 1925 to 1929, inclusive, that appeared to have normal egg records were included in this study.

Winter and spring clutch size showed a nonlinear relation, and the correlation ratio between the two was 0.4171. The same was true of winter and summer clutch size with a correlation ratio of 0.3091. Spring and summer clutch size showed a linear relation to each other and a coefficient of correlation of  $+0.4593 \pm 0.013$ . Winter clutch size showed a high degree of correlation with age at first egg. The degrees of correlation between winter clutch size and winter pause duration, winter clutch and days broody, and winter clutch and persistency were very moderate but slightly significant. Spring clutch size showed a nonlinear regression to winter pause duration, with a correlation ratio of 0.3596.

The clutch size for the individual months studied was independent of age at first egg, winter pause duration, total days broody, and persistency. Summer clutch size was independent of age at sexual maturity, moderately correlated with winter pause duration and persistency, and had a coefficient of correlation of 0.3531 with total days broody. As indexes of annual egg production, the short-time measures ranked in the following order: spring, summer, winter, April, May and March clutch. Generally the clutch size increased following either the winter pause or a broody period. The mean clutch size for the flock was: winter, 3.35; spring, 4.07; and summer, 3.04.

No short-time measure of intensity was so accurate as the mean clutch size for the entire year.

*The Accuracy of Periodically Weighing a few Representative Eggs to Determine the Total Monthly and Yearly Points Produced.* W. M. Ginn, Poultry Science, 1932, p. 40.

In order to compare the records made by weighing every egg laid with those made when a representative few were weighed, the Louisiana

Experiment Station examined records of the 1929-30 Louisiana egg-laying contest. Every egg laid by twenty pens of the Mediterranean class and seven pens of the American class had been weighed individually, and the data were compared with results that would have been obtained if only the eggs from each hen laid on the first and fifteenth of each month had been weighed.

The comparisons showed that during the first five months of the pullet year the total points produced by pens were generally greater when derived by weighing every egg than when derived by weighing only two eggs per month. The opposite was true for the next few months. Based on these results, it was concluded that weighing two eggs per month is accurate enough for all practical purposes.

*Characteristics of non-broody and intense broody Lines of Rhode Island Reds.* F. A. Hays, Agric. Exp. Station, Amherst, Mass. Bulletin, No. 301, 1933.

**Summary:**

1. Two lines of Rhode Island Reds, bred for non-broodiness and broodiness, respectively, were carried through a nine-year period to study the nature of the broody instinct and its relation to fecundity.

2. These two lines proved to be essentially identical in age at sexual maturity, winter clutch size, and annual persistency.

3. The non-broody line exhibited a shorter winter pause than the broody line, and also more families free from pause.

4. The mean percentage of non-broody daughters, for the period of the experiment, was 72.66 in the non-broody line and 20.46 in the broody line.

5. Dams free from broodiness for three or more years gave a significantly greater proportion of non-broody daughters than was obtained from dams free from broodiness for one or two years only.

6. The data indicate that broodiness cannot be entirely eliminated by the selection of aged broody-free dams. It seems probable that the breeding test for males offers the only possible solution.

7. The two lines showed a distinct difference in degree of broodiness in broody individuals as measured by the number of broody periods. The non-broody line had  $2.63 \pm .16$  periods and the broody line  $3.99 \pm .11$  periods in this experiment.

8. Degree of broodiness is definitely inherited, as shown by the fact that daughters showed a definite and consistent increase in degree of broodiness as the number of broody periods of the dams increased.

9. No difference in mortality in the laying houses was observed in the two lines.

10. Mean winter egg production was about twelve eggs greater per individual in the non-broody line.

11. Annual egg records were significantly higher for non-broody birds in the non-broody line than for non-broody birds in the broody line.

12. Annual egg production of broody birds in the non-broody line was greater than that of broody birds in the broody line.

13. When all birds are considered, the average annual production was  $209.81 \pm 1.67$  eggs for the non-broody line as compared with  $179.02 \pm 1.34$  eggs for the broody line.

*The feeding value of crop-milk of pigeons.* L. Reed, L. Mardel, B. Vickery, American Journal of Physiology, 1932, p. 285.

The crop-milk contains vitamins A and B. The milk has a healing effect on scerophthalmia and promotes growing.



Bird's-eye view of the Buildings where the 6th World's Poultry Exhibition will be held.  
Berlin July 31th - August 10th. 1936.

*Egg-Production. La Produzione delle Uova.* F. Clementi, Federazione Italiana dei consorzi agrari. Piacenza.

**Contents:**

1. Egg production in Italy and its economic value. 2. Exterior characteristics of a good hen. 3. Fertility. 4. Nutrition. 5. The Poultry House. 6. Parasites. 7. Marketing Eggs.

*The Utility of the Bohemian Goose.* Dr. J. Hlouska, Institut für Züchtungsbiologie, Prague, Czecho-Slovakia.

**Summary:**

The principal aim of the present treatise was to compare the utility of the Bohemian goose as to the quality and quantity with the production of the Pommern and Emden geese, the mentioned foreign races having been and being in our geese breeding in most cases used for crossing. This comparative study is made on the basis of the row of many trials made partly with Bohemian farmer geese, partly with the Pommern and Emden geese and partly with their crossings.

It follows from the results of these comparative investigations and observations of the development of geese of all three races held in Bohemia that the Bohemian goose is marked, not only as the breeding is concerned but also the utility, by very much advantages against the foreign geese races. This fact is today confirmed by the great number of our breeders, especially from agriculturally poorer regions with rougher climate, where neither the pure-blood breeds of these foreign races nor their cross-breeding with the Bohemian goose gave satisfactory results. Comparatively best results gave the crossbreeding of the Bohemian goose with the old type of Pommern geese which stood very near to the Bohemian goose by their exterior and utility. But because Pommern of today has deficiency of original Pommern geese the cross-breeding with the Bohemian goose can be realized in no larger measure. Therefore greater attention is paid to the endeavour to regenerate the breeding of Bohemian goose and to annoble it by the breeding selection and utility control within the race itself, therefore not by crossing. The preliminary results of our comparative tentatives as well as practical experiences of breeders let hope that this action, if the pure blood breeding of the Bohemian goose will be carried on systematically, rationally and in a larger measure than it was the case up today, will essentially assist to the regulation of breeding and production of our geese industry than the cross-breeding.

*Geese.* R. Appleyard. Published by Poultry World Ltd., 4, Carmelite Street, London, at 2/6.

Mr. Appleyard's book on geese and their management is very welcome.

He treats his subject fully and clearly, giving not only information regarding the general management and production of geese, from the care of the breeding stock through the various methods of incubation and brooding till the fat geese are sold at Michaelmas and Christmas, but solving the various knotty problems that invariably arise to perplex the aspiring goose breeder.

There are chapters on the various breeds of geese, with useful information as to their respective merits, ranging from the table to the ornamental breeds. Where comparatively small sized birds for table use are required Mr. Appleyard recommends the Roman goose, and he is

experimenting in the production of a bantam Embden goose of 6-7 lbs. weight to meet the requirements of the small present-day families.

He concludes with a chapter on diseases—a very brief chapter, for the goose is hardy and not prone to the usual diseases that attack fowls.

This book should appeal to poultry farmers as well as to goose enthusiasts, for geese are better than sheep or the scythe for keeping down the grass in fowl pens, and, as Mr. Appleyard demonstrates so clearly, geese are very easy to rear and can prove very profitable.

*Securing early turkeys by stimulated egg production.* W. P. Albright and R. B. Thompson, Poultry Science, 12, 1933, No. 2, pp. 124-128.

At the Oklahoma Experiment Station breeding turkeys were kept closely confined with satisfactory results. Egg production was stimulated by the use of a laying mash and morning lights, beginning the first of December. With this system of management the first egg was laid on December 26, and a pullet reached sexual maturity at 237 days of age. The peak of egg production was reached in March, and the first poults were hatched in February. The average fertility of the eggs of these turkeys was 86.2 percent and the average hatchability 67.3 percent. The turkeys consumed an average of 6.9 lb. of mash, 7.2 lb. of grain, and 0.6 lb. of oyster shell per month.

*Turkeys.* T. D. Bell and V. K. Tallent, Gt. Brit. Min. Agr. and Fisheries Bul. 27, 1933.

The production, feeding, management, killing, marketing, and control of diseases of turkeys are discussed.

# NUTRITION

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## VITAMINS

### VITAMIN A

*Vitamin A and D studies with growing chicks.* H. S. Gutteridge, Scientific Agriculture, 13, 1933, p. 374.

In this study at the Central Experimental Farm, Canada, six lots of chicks were fed to determine the efficiency of cod-liver oil and pilchard oil in the production of normal bones and in the prevention of rickets. A basal ration free of vitamin A was fed in five lots, to which the oils were added at either 1 or 2 percent levels. The sixth lot received a standard ration containing 1 percent of cod-liver oil. All lots were irradiated for 10 minutes daily with a mercury vapor lamp except the lot receiving the basal ration only, which received 20 minutes' irradiation.

Both oils when used as supplements to a basal ration free of vitamin A increased the growth and prevented the development of deficiency symptoms. Neither pilchard oil nor cod-liver oil when fed at a 1 or 2 percent level with the basal ration supplied sufficient vitamin A to promote as rapid growth as occurred in the lot receiving the standard ration. The results indicated that pilchard oil and cod-liver oil were of equal value so far as their vitamin A content was concerned, with a suggestion that the pilchard oil was somewhat the more efficient in this respect.

*Vitamin A concentration of cod liver oil correlated with age of cod.* N. L. MacPherson, Nature, London, 1933, p. 26.

Studies at the biological laboratory of the Newfoundland Fisheries Research Commission on the cause of variations in the vitamin content of cod-liver oils have led to the conclusion that the relative value of the oils from different sources depends upon the growth rates and ages of the cod at these sources, the older the cod the higher being its concentration of vitamin A. The higher content of vitamin A in samples from the west coast than from the east coast of Newfoundland is attributed to the preponderance of older fish on the west coast. Increasing concentration with age is thought to represent an accumulation due to effective daily retention by the livers of small amounts of both carotene and vitamin A ingested.

*An inhibitor of the antimony trichloride test for vitamin A in cod liver oil.* A. Emmerie, Nature, London, 131, 1933, No. 3306, p. 364.

Attention is called to previous observations that traces of substances like furan, indole, and skatole inhibit strongly the intensity of the absorption band of vitamin A with antimony trichloride at 620 m $\mu$ . On the theory that there must be such an inhibitor in cod-liver oil, inasmuch as the color reaction is much stronger with the unsaponifiable fraction than with the original oil, attempts were made to isolate the

inhibitor. After various failures success was achieved by saponifying the cod-liver oil, acidifying it, dissolving the mixture of acids in 5 volumes of petroleum ether, drying with anhydrous sodium sulfate, and shaking vigorously with  $\frac{1}{10}$  volume of diluted sulfuric acid. On pouring the sulfuric acid layer into a large volume of cold, saturated sodium sulfate solution, extracting the mixture several times with petroleum ether, and evaporating the solvent, the inhibitor remained as an oil which was purified by distilling, dissolving in petroleum ether, and again shaking out with sulfuric acid. The purified substance is said to be a pale yellow viscous oil of molecular weight 332 and empirical formula  $C_{21}H_{36}O_3$ . It has an inhibiting power from 4 to 5 times as great as indole, and with a platinum catalyst absorbs about 4 atoms of hydrogen per molecule, with loss of inhibiting power.

*Vitamin A Content of Barley.* E. H. Hughes, Cal. Agric. Exp. Station, Journal of Agricultural Research, Vol. 47, 1933, p. 487.

**Summary:**

Barley as the only source of vitamin A in the diet did not produce normal growth in rats.

In the sexually immature rat the addition of vitamin A to a barley diet (barley being the only source of vitamin A) resulted in a decided increase in growth and a normal oestrous cycle.

As measured by increase in growth and by daily vaginal-smear record of rats, barley contains more vitamin A than does white corn, but less than yellow corn.

In these studies it has been shown that barley contains less than one sixth as much vitamin A as does yellow corn.

## VITAMIN B

*The physiologic Action of the Extract of Vitamin B.* Dr. M. Skarzynska-Gutowska, Université Agricole, Warsaw, Poland.

The action of vitamin B from wheat bran in the digestive organs, the kidneys and the respiratory organs was controlled. According to the author choline, potassium and possibly histamine are the active ingredients of extract of vitamin B. Choline, potassium-salts and histamine have a specific action on avitaminosis B.

*The use of the chick in vitamin B<sub>1</sub> and B<sub>2</sub> studies.* O. L. Kline, J. A. Keenan, C. A. Elvehjem, and E. B. Hart, Jour. Biol. Chem., 99, 1932, No. 1, pp. 295-307, figs. 6. (Ref. Exp. Station Record, Vol. 69, p. 844.)

A ration has been developed at the Wisconsin Experiment Station which can be made deficient in vitamin B<sub>1</sub> or B<sub>2</sub>, respectively, by different heat treatments. This diet, known as Ration 240, is composed of yellow corn, middlings, casein, salt, cod-liver oil, and calcium carbonate 58:25:12:1:2:2. When the ration was autoclaved at 120° F. and 15 lb. pressure for 5 hours and then fed to chicks, the birds developed severe polyneuritis in about 8 days. Adding air-dried yeast or a vitamin B<sub>1</sub> supplement corrected this deficiency. When used as a basal ration for vitamin B<sub>1</sub> studies, the abovenamed ration was usually supplemented with vitamin B<sub>2</sub> in the form of 4 percent of autoclaved yeast. When Ration 240 was heated dry at 95° to 100° for 144 hours and then fed to chicks they developed pellagra at about 3 weeks of age. The addition of autoclaved yeast made this ration complete.



*A study of the heat stability of the vitamin B factors required by the chick.* C. A. Elvehjem, O. L. Kline, J. A. Keenan, and E. B. Hart, Jour. Biol. Chem., 99, 1932, No. 1, pp. 309-319, figs. 4.

Continuing the above study, it was found that the vitamin B<sub>1</sub> in yeast and in Ration 240 was completely destroyed by autoclaving and inactivated to a great degree by heating moist at 100° F. for 24 hours. However, the vitamin B<sub>1</sub> potency was not reduced by heating dry at 100° for 24 hours. The rate of decrease of potency in B<sub>1</sub> in the presence of moisture declined as the pH value increased. After 24 hours' heating at 100° there was no noticeable destruction of B<sub>2</sub> in Ration 240. However, half the potency was lost after 72 hours and the destruction was practically complete after 144 hours' heating. Dried bakers' yeast, containing about 25 times as much vitamin B<sub>2</sub> as Ration 240, lost half its potency after heating dry for 144 hours.

It was found that chicks do not require the heat-labile B<sub>3</sub> or any other factor that is destroyed by heating at 100° or below for 24 hours.

*Avian polyneuritis.—Further studies on the action of vitamin B<sub>1</sub> concentrates in vitro.* A. D. Melklejohn, Biochem. Jour., 27, 1933, p. 1310.

Continuing the series of studies which have established the relationship between vitamin B<sub>1</sub> and the oxidative removal of lactic acid in the brains of pigeons, the hypothesis that the defect in the vitamin B<sub>1</sub>-deficient brain is the failure in oxidative removal of lactate was tested by the addition of a vitamin B<sub>1</sub> concentrate to deficient brain in vitro and determining the oxygen uptake and concentration of lactate. There was, however, no apparent removal of the lactate corresponding to the increased oxygen uptake induced by the addition of the vitamin B<sub>1</sub> concentrate.

The author concludes that "the lesion in vitamin B<sub>1</sub>-deficient brain affects an oxidase system that is associated with lactate, but is not concerned with the removal of lactate itself in isolated brain tissue".

## VITAMIN D

*The Value of Vitamin D Preparates for Chickens. Een onderzoek naar de waarde van enkele Vitamine D preparaten voor kuikens en tevens naar de mogelijkheid Vitamine D preparaten door middel van kuikens te standaardiseeren.* Dr. J. Voet, Dissertation University Utrecht, Holland.

The results obtained with various vitamin D preparates differ considerably. For this reason an investigation was carried out with a view to ascertaining the value of these preparates for the rearing of chickens, especially of those preparates which are recommended as remedies against rhachitis.

Further experiments were carried out in connection with the histologic build of the legs of chickens, as there is but little information in literature concerning this subject.

### Summary:

1. With an equal number of international units the activity of Davitamon D, Dohyfral and cod-liver oil for the prevention of rhachitic processes in chickens agreed. Vigantol is less active with an equal number of units.

2. The most important factor for the prevention and cure of rhachitis in chickens is the proportion of Ca and P in the food. The absolute quantity of these substances is of much less importance.

3. Davitamon D, Dohyfral and Vigantol exercise a favourable influence on the growth when the given quantities prevent or cure rhachitis. Codliver oil does not always have this influence.

4. Treatment with sun-rays always has a curative effect on rhachitic processes. If vitamin D preparates are given in addition, this aids the action and accelerates the recovery.

5. It is not possible to carry out standardisation test of Vitamin D preparates on chickens which would be just as accurate as similar tests on rats, owing to the large quantities of vitamin D which chickens need, as this causes a lesser degree of sensitiveness to the differences in the content of vitamin D in the preparates.

### *Fish Oils as a Source of Vitamin D for Growing Chicks.*

J. S. Carver, A. Brunstad, J. L. St. John, F. W. Frasier, and K. M. Athow, June, 1933, Bull. 284, Agric. Exp. Station, Pullman, Washington.

The addition of one-half per cent of biologically tested sardine oil to the total ration prevented rickets when the ration used contained the necessary amounts of calcium and phosphorus. Excellent results in growth and calcification were secured with the calcium level from one to one and eight-tenths per cent and a level of phosphorus between eight-tenths per cent and one per cent.

### *The antirachitic value of sardine oil for growing chicks.*

F. E. Mussehl and C. W. Ackerson, Poultry Science, 12, 1933, No. 1, pp. 31-33, figs. 2.

A basal ration complete in all known essentials except the antirachitic factor was fed to seven lots of chicks at the Nebraska Experiment Station. This ration was supplemented in various lots with such vitamin D supplements as cod-liver oil, direct sunshine, sardine oil, and different proportions of sardine oil and corn oil.

The results indicate that sardine oil contained appreciable amounts of the antirachitic factor, but not so much as the cod-liver oil used in these tests. When the sardine oil was fed at a 0.5 percent level it promoted good calcification in chicks in this study.

### *Fish Oils as a Source of Vitamin D.* J. L. St. John, R. H. Johnson, and Arthur Brunstad, Agric. Exp. Station, Pullman, Washington, Bull. No. 291, Jan. 1934.

Numerous variations of the ash method used as a criterion of the effectiveness of vitamin D supplements are employed by different workers. The results of certain of these variations are pointed out and the need for a standard method is emphasized in Poultry Science 12: 34. The efficiency of several lots of sardine and pilchard oil was determined, using chicks, and it was found that 0.25 and 0.50 per cent of these oils did not afford protection from rickets unless the calcium and phosphorus

levels were adequate, when the 0.5 level furnished protection. These results are reported in Experiment Station Bulletin 284.

The composition of the egg shells from rachitic and normal birds shows less calcium in the former. Blood calcium and phosphorus are lower in rachitic than in normal birds. Increased amounts of vitamin D raise the level of blood calcium and phosphorus in normal birds.

*Vitamin D Requirements of Growing Chicks and Laying Hens.* J. S. Carver, D. Brazie, and E. I. Robertson in cooperation with the Division of Chemistry, Agric. Exp. St. Pullman, Washington, Bull. No.291, Jan. 1934.

Eleven lots of White Leghorn chicks, each containing 200 chicks, were started on this experiment April 2, 1932, and are to continue for two years. All lots were fed on the same standard all-mash ration. Lots one to six inclusive were kept in confinement with no exposure to sunlight and fed biologically tested concentrated vitamin D supplement at levels of 0, 1/32, 1/16, 1/8, 1/4, and 1/2 per cent of the total ration. Lots seven to eleven inclusive received the same treatment, had access to wire-screened sunporches throughout the day, and received the vitamin D supplement levels of 0, 1/32, 1/16, 1/8, and 1/4 per cent respectively. All of the cockerels were removed at four weeks of age and data gathered from pullets only from then on. At 24 weeks of age the number of birds in each pen was reduced to 42. All records are being secured by 28-day periods. From the twenty-fourth week on, data are being collected on trap nest egg records, weight, physical condition, mortality of the birds, and feed consumption. Individual egg studies are being made on one week's production from each bird. This includes the weight, volume, shell texture, and interior quality as seen under a candle, the interior quality as the egg is broken out, air-dried and oven-dried weight of the shell, and the per cent ash in the shell.

Hatchability tests are being made on the eggs produced from each lot during the fourth week of each period. The representative period tests are being run on all chicks hatched from each pen to determine the liveability of the chicks and the vitamin D reserve or carry-over from the parent to the offspring as influenced by the various levels of vitamin D supplement supplied to the hens.

*Free fatty acids in cod-liver oil and vitamin D.* O. Schultz, Ztschr. Vitaminforsch., 1, 1932, No.4, pp.287-289.

The possible destructive effect of free fatty acids on the vitamin D content of cod-liver oil was tested by determining four times during a period of 2 yr. the vitamin D content of six samples of oil varying in content of free fatty acids from 1 to 20 percent.

All of the samples had lost about 30 percent of their activity at the end of the experimental period, no differences being detectable between samples of high and low fatty acid content. The author concludes that manufacturing methods, with the exception of bleaching, have no effect upon the vitamin D content of cod-liver oil.

*Effect of sources of vitamin D on storage of the antirachitic factor in the egg.* G.M.DeVaney, H.E.Munsell, and H.W. Titus, Poultry Science, 12, 1933, No. 4, pp.215-222.

The U.S.D.A. Bureaus of Home Economics and Animal Industry undertook a study to determine (1) the relative value of cod-liver oil and

viosterol in the ration of hens as sources of vitamin D in egg yolks, (2) the relationship between the amounts of vitamin D in the ration and the amounts stored in the yolks at various levels of feeding, and (3) the limiting capacity of the hen to store vitamin D in the egg when fed either of these supplements. The eggs from 10 pens of Rhode Island Red hens fed varying amounts of vitamin D from several sources were used in this experiment, and the eggs from yearling hens on range receiving cod-liver oil were also included for comparative tests. The study covered a period from November through July.

In the amounts usually fed the vitamin D of cod-liver oil was more efficiently stored in egg yolk than was the vitamin D from an equivalent amount of viosterol. At a 2 percent level of cod-liver oil feeding the amount of vitamin D in the yolk was significantly higher than at a 1 percent level. Increasing the level to 4 and 6 percent did not result in greater storage. Within the limits studied, the antirachitic value of egg yolk varied with the potency of the viosterol in the diet. Irradiating for 15 minutes with a carbon arc lamp had practically the same effect on the vitamin D content of the yolk as 1 percent of cod-liver oil.

*The antirachitic value of pilchard oil (sardine oil) for growing chicks.* J. Biely and V. E. Palmer, Scientific Agriculture, Vol.14, 1933, p.136.

Continuing the above study, two experiments were undertaken to obtain additional data on the antirachitic potency of various samples of pilchard oil produced in British Columbia.

The chickens fed the basal ration which was deficient in vitamin D, supplemented at 0.5 and 1 percent levels with commercial pilchard oil, had practically the same ash analyses as chicks fed the same basal ration supplemented with 1 percent of medicinal cod-liver oils.

*Observations on the bone ash method of determining effectiveness of vitamin D supplements.* J. L. St. John, C. Kempf, and L. Bond, Poultry Science, 12, 1933, No.1, pp. 34-36.

Because of the variations that exist in the method for the determination of the value of vitamin D supplements by means of bone ash analyses, the Washington College Experiment Station undertook a study of the methods used.

No difference in the percentage of ash could be detected in bones analyzed at once and those analyzed after 2.5 months' storage in a drying cabinet maintained at a temperature of  $65 \pm 2^\circ$  C. Based on the results of the study, the following procedure is recommended for ash determinations: Remove flesh and connective tissue from the tibia, wipe the bone clean with crenolin, and rub off the proximal and distal cartilages; after drying in a steam-heated drying cabinet at  $65 \pm 2^\circ$  for 24 hours, extract the bones in a Soxhlet extractor with 95 percent alcohol for 48 hours, turning the bones end for end after 24 hours; dry the bones in a beaker on a steam bath, crush and place in weighed crucibles, dry in an oven at  $100^\circ$  to constant weight, and cool in a desiccator; and ash the bones in a muffle furnace, starting with the furnace cold and gradually increasing the temperature to  $650^\circ$  for 3 hours or until a white ash is obtained. The ash can then be weighed and the percentage calculated of a dry, fat-free bone.

*Photographic records of vitamin D line tests.* H. Stevens and E.M. Nelson, Indus. and Engin. Chem., Analyt. Ed., 4, 1932, No.2, pp. 200, 201, fig. 1. (Ref. Exp. Station Record, Vol.69, p.786.)

This contribution from the Bureau of Chemistry and Soils, U.S.D.A., describes a rapid and economical method developed by the authors for obtaining photographs of vitamin D tests. "The photographs reproduce well either in half-tone or lantern slides, and they enlarge satisfactorily to several diameters. The procedure described can be successfully followed with little practice, and satisfactory records may be rapidly produced by technicians with little knowledge of the principles of photography."

*Photographic recording of line tests for vitamin D.* A.L.Bacharach, E.Allchorne, V.Hazley, and S.G.Stevenson, Indus. and Engin. Chem., Analyt. Ed., 5, 1933, No.1, pp.12-14, figs.6. (Ref. Exp. Station Record, Vol.69, p.786.)

A photographic method for keeping permanent records of vitamin D line tests, developed independently of the method described by Stevens and Nelson, noted above, and differing from it in a number of details but not in general principles, is described in order of the successive stages of procedure.

*The comparative antirachitic Efficiency of irradiated Ergosterol and Cod Liver oil for the Chicken and a Description of a more reliable Method for the Determination of rachitic Leg Weakness in Baby-Chickens.* M. J. L. Dols, Archives Néerlandaises de Physiologie de l'Homme et des Animaux, Vol.19, 1934, p.290.

Chickens require many times as many rat units of vitamin D in the form of irradiated ergosterol as in the form of cod liver oil for normal bone formation. Author is the first who used the deformities of the ribs as a criterion to compare the antirachitic efficiency of food-stuffs. From these experiments is concluded that irradiated ergosterol dissolved in peanut oil is less effective to prevent chickens against rachitic leg weakness than the rat equivalent amount of cod liver oil. The question how to explain this difference will be examined in further experiments.

*Irradiation of chicks.* M. W. Miller, G. E. Bearse, and G. Cushing, Poultry Science, 12, 1933, No.1, pp.21, 22, fig.1.

At the Western Washington Experiment Station, four lots of 15 White Leghorn chicks each were fed the same basal ration in batteries in a room from which sunlight was excluded. In addition to the basal ration, lot 1 received 0.125 percent of fortified cod-liver oil; lot 2, 7 hours of irradiation with a CX Mazda lamp with an aluminum reflector at a distance of 10 in.; lot 3, 14 hours of irradiation; and lot 4, the basal ration only.

Satisfactory growth was made by all groups except lot 4. During the

8 weeks of this test, one chick in lot 3 and three chicks in lot 4 died. Line tests indicated normal calcification in lots 1 and 3, slight rickets in some birds in lot 2, and severe rickets in all chicks in lot 4. Ash analyses showed relatively high average ash percentages for lots 1, 2, and 3.

These results show that the 60-w CX Mazda lamps, while not a rich source of ultraviolet light, will prevent rickets if chicks are exposed over 7 hours at a distance of 10 in.

### *Treatment of Rhachitis.* La Clinica Veterinaria, 1933, June.

Good results were obtained with injections of neutral sodium-citrate in the treatment of rhachitis. The balance between acids and bases is restored.

### *Nutrition and Hatchability.* W.R. Graham. Ontario Agricultural College, Guelph. The U. S. Egg and Poultry Magazine, Feb. 1931, p. 66.

#### **Conclusion :**

There is a difference in the protein sources as to the hatching power of the eggs produced.

Cod Liver Oil does not give the same results in combination with all the animal proteins. Cod liver oil did not act as a substitute for sunlight in all rations.

### *Factors involved in malformation of the bones of growing chickens.—I, The value of egg yolk and chicken fat.* E. W. Henderson, Poultry Science, 12, 1933, No. 2, pp. 91-96, fig. 1.

A basal ration of three common grain products, bone meal, and salt was fed to eight lots of 25 White Leghorn chicks each, housed in battery brooders at the Iowa Experiment Station in an effort to reproduce leg deformities in such chicks and to determine the cause of this condition. The basal ration was supplemented with various amounts of protein concentrates, and in some cases cod-liver oil and chicken fat were added.

The results of the study showed that the deformities resulting from battery brooding or the all-mash method of feeding or both were probably rickets, but they were not prevented by feeding cod-liver oil. Egg yolk known to contain vitamin D did not cure this type of rickets, nor did chicken fat possess any curative properties. It was thought that this type of rickets was due to an excess of calcium or phosphorus or both. When the calcium and phosphorus both exceeded 1.8 percent of the total ration, the percentages of deformities and retarded growth were high.

### *Calcium-phosphorus metabolism in the chicken.—IV, Ergosterol requirement of growing chicks.* E. J. King, H. Hull, and G. E. Hall, Poultry Science, 12, 1933, No. 2, pp. 129-132.

Continuing this series of studies at the University of Toronto, it was found that irradiated ergosterol was not as effective as cod-liver oil in preventing rickets in chickens. The difference in the antirachitic power of these two sources of vitamin D was not so great with a ration

containing a normal calcium-phosphorus ratio as when these minerals were present in an abnormal ratio. There were some indications that irradiated ergosterol was more effective when administered orally than when mixed with the feed.

## MINERALS

*Influence of Iodine on Egg Production.* A. Zajtay, Göddöllő, Hungary, *Die Tierernährung*, 1934, p. 102.

In this experiment two groups of 55 hens were used, one of which was given 3,125 m.gr. of iodine per day. The experiment was continued for one year. Contrary to the results obtained by Scharrer and Schropp, the average egg production of the iodine group was higher (189,7 and 166,7 eggs respectively). The hatching results were also better.

*Iodine in Poultry Food. Beigaben von Jod zum Hühnerfutter.* Prof. Dr. W. Klein, *Archiv für Geflügelkunde*, Vol. 7, 1933, p. 65.

### Summary:

In a farm of hens standing under control the influence of iodine cod-liver oil on moulting and the result of laying was examined on 500 leghorn hens two and three years old. The examination took place before, during and after moulting. A high class flock of 65 hens 2 years old got exactly the same quantity of cod-liver oil, but without any iodine. The result represented in curves show that birds fed iodine are superior in laying about 25 % to the birds fed without iodine ones. The quantity of iodine given daily amounts to 1,5 mg (in the maximum). The communicated dates refer to the time from July 1932 to January 1933.

The state of health and the constitution of the hens does not suffer from the feed with iodine.

The results of laying in September, the month of moulting, are likewise given from the years 1928 till 1932. In 1928 and 1929 iodine was added to food, 1930 and 1931 none, and 1932 iodine was given again. Similar differences proved here between the groups with and without iodine in the feed.

In these experiments the dose of iodine did not displace the beginning of moulting.

*Influence of Iodine upon Moults. Jodfütterung bei mausernden Hennen.* Dr. A. Wehner, *Archiv für Geflügelkunde*, Vol. 8, 1934, p. 143.

### Summary:

The daily dosing with 0,5 mg of iodine, in the form of iodine of potassium or iodine tincture, cannot have any influence on the course of the moult. Any influence on the condition, egg-laying capacity and hatchability of the eggs, either in a negative or positive sense, is just as little ascertainable.

*The truth concerning the Iodine Problem. Klarheit in der Jodfrage.* H. Trapp, *Norddeutscher Geflügelhof*, 12 and 19 Jan. 1934.

On the ground of an extensive study of literature, the sources of which are given, the author comes to the conclusion that the feeding

of iodine to poultry in Germany is unnecessary, no matter in what form. It can be harmful both to human beings and animals and involves high costs, which do not benefit the poultry keeper, but the sellers of iodine preperates.

*The influence of additions of iodine on the egg production of two-year-old hens before, during, and after molt.*  
W. Klein, Archiv für Geflügelkunde, 1933, p. 65.

In a series of studies at the Agricultural High School at Bonn-Poppelsdorf, Germany, a special iodized cod-liver oil marketed under the name of Iocol was fed to chickens of different ages. The chicks receiving iodine showed a more rapid development of the comb, making it possible to pick out males about a week earlier than in the control groups. No injurious effects were noted on body development. In the case of two-year-old hens the iodized birds started to molt at the same-time as the controls but shed their old feathers and grew the new feathers more quickly. During the molting period the iodized birds showed greater activity and spirit and redder combs and wattles than the controls. The body temperature was also about 0.5° F. higher in the iodized group. In the case of about 20 percent of the iodized hens the comb became smaller but did not lose its firmness and fine red color. Egg production was a great deal higher in the iodized group than in the control group, but in spite of heavy laying the iodized birds kept in good body condition.

*Effect of fluorine on growth, calcification, and parathyroids in the chicken.* H. M. Hauck, H. Steenbock, J. T. Lowe, and J. G. Halpin, Poultry Science, 12, 1933, No. 4, pp. 242-249, fig. 1.

The Wisconsin Experiment Station carried out three experiments with growing chicks and one with pullets to show the effects of feeding fluorides to chickens. Sodium fluoride was fed in amounts ranging from 0.015 to 1.2 percent of the ration.

No unfavorable effects were observed in the appearance or weight of chicks fed sodium fluoride up to levels of 0.15 percent. At the 0.3 percent level the appetite and weight of young chicks were depressed, but there was no effect on 2- and 3-month-old chicks. At a 1.2 percent level sodium fluoride was markedly toxic to chicks of all ages. There was an apparent lowering of serum calcium in young chicks ingesting 0.6 and 1.2 percent of sodium fluoride, but there was no evidence of any effect on the serum calcium or inorganic phosphorus of older chicks. Within the limits of the study there was no consistent effect on the bone ash. No significant effect on the kidney phosphatase or on the size and structure of the parathyroids due to sodium fluoride feeding was noted. Small hemorrhages were observed in the duodenal loop of some chicks at all levels of fluorine feeding. There was a depression of weight and a marked decrease in production of pullets ingesting 0.96 percent of sodium fluoride.

*Iodine Feeding for Egg Production.* A. I. Malan and G. S. G. Malan. Onderstepoort. S. A. The South African Poultry Magazine, August 1931.

**Discussion of Results:**

A comparison of the egg production of the groups shows no outstanding difference for any group. If the difference in the total



number of eggs produced by the duplicate batches of any group be taken as approximately a normal fluctuation then the iodine has had neither beneficial nor detrimental effects on the egg production. It may be mentioned that in only one of the nine groups receiving potassium iodide was the egg production better than in the groups where iodine had been omitted from the mash. The results given in Table IV are interesting, but not conclusive. It is true that a higher percentage of the eggs of the control group hatched, but the difference, without confirmation, is not particularly significant.

In conclusion, it must be mentioned that there is no reason for believing that the ration of the birds was iodine deficient.

*Study of the Calcium-Phosphorus Ration in Feeds for Chicks.* Sherwood. 43rd Annual Report, College Station, Brazos Country, Texas, 1930.

In a series of experiments relating to the study of the calcium phosphorus ratio in a ration for growing chicks, the preliminary results indicated that a Ca-P ratio of 1:.29 and ratios up to 1:.57 gave more satisfactory results than a ratio of 1:1.42. This work is being continued and will be carried through a longer growth-period of the chicks.

*The nature of the calcium and phosphorus combination in the excreta of the non-laying pullet.* F. Knowles, J. E. Watkin, and F. W. F. Hendry, Jour. Agr. Sci., England, 1933, p. 196.

In this test at the East Anglian Institute of Agriculture, eight White Wyandotte pullets were fed three rations which differed only in the amounts of calcium and phosphorus supplied in various combinations. The birds were fed separately in metabolism cages, and the excreta were collected with a minimum contamination by particles of food.

From the results obtained it was concluded that, in the case of a ration containing adequate amounts of calcium carbonate, the normal form in which phosphorus was excreted by the nonlaying pullet was as dicalcium phosphate. Any excess of calcium needed over the amount required for the formation of the above compound was excreted as calcium carbonate.

*Effect of calcium carbonate and calcium sulphate on bone development.* H. W. Titus, E. McNally, and F. C. Hilberg, Poultry Science, 12, 1933, No. 1.

In a study by the U.S.D.A. Bureau of Animal Industry, Rhode Island Red day-old chicks were divided into two series of seven pens and were fed diets in which the calcium-phosphorus ratios ranged from about 3.5:1 to 5.7:1. In one series a mixture of calcium carbonate and steamed bone meal was used as the mineral supplement, while in the other series the mixture was made of calcium sulfate and steamed bone meal. In both series the calcium content varied from approximately 2.7 to 3 percent.

As the calcium-phosphorus ratio increased, it was found that the average ash content of the femur and tibia of the chicks gradually decreased in the pens receiving calcium carbonate but had a slight tendency to increase in the pens receiving calcium sulfate. It is concluded that experimental evidence now available shows that there is no calcium-

phosphorus ratio which is optimum for all diets for growing chicks. The metabolic acid base balance appears to be one of several factors influencing bone development.

*Calcium and Phosphorous Requirements for Growing Chicks, I, II.* W. C. Tully, S. M. Hauge, C. W. Carrick, and R. E. Roberts, *Poultry Science*, 1931, pp. 299-318.

The Indiana Experiment Station reports results of two studies.

*I. Studies with salt mixtures under rachitic conditions.*

The general plan of the four trials in this study as regards the varieties of chicks used and the methods of selection, feeding, and management was the same as previously noted. The mineral mixtures used in the various lots were either McCollum's Mineral No. 185 or modifications of it.

It was found that these mineral mixtures, when used with a semipurified ration in the absence of vitamin D, did not produce satisfactory growth or normal bone formation. When vitamin D was added, the chicks approached optimal growth. In the absence of vitamin D, 6 or 8 per cent of a mineral mixture with a calcium-phosphorous ratio of 1:0.608 produced better results than 4 per cent of the mixture. In this study good growth was not obtained when young chicks were fed a mineral mixture made up chiefly of dibasic calcium phosphate, either with or without an adequate supply of vitamin D in the form of irradiation.

*II. Studies with natural minerals under rachitic conditions.*

In this phase of the study four trials were conducted with Barred Plymouth Rock chicks using natural minerals as sources of calcium and phosphorous. The results showed that oyster shell and steamed bone meal or limestone grits and steamed bone meal were superior to mineral salts as sources of calcium and phosphorous in the absence of vitamin D. A calcium-phosphorous ratio of about 1:0.3 produced the best results. Limiting the phosphorous content of the ration to 0.66 or less per cent noticeably reduced the rate of growth. In these studies no combinations of minerals were found that would prevent rickets in the absence of vitamin D.

*Oyster Shell Vs. other forms of Lime in Feeding.* Canada Poultryman, August 1934.

Owing to frequent requests for information the Sidney Experimental Station undertook feeding trials with the various forms of calcium carbonate on the market for feeding poultry. The experiment was undertaken with the three forms namely, oyster shell, clam shell and limestone. Analysis showed all three as being very similar in composition, being almost entirely composed of calcium carbonate ( $\text{CaCO}_3$ ).

Three pens were fed in the same way except for change in the lime ration. The strength of the shell was determined by special apparatus measuring the pull necessary to break the shell. Oyster shell, based on this one year's work, demonstrated its worth both in strength and production.

*Feeding Chloride of Calcium. Die Verfütterung von Chlorkalzium an Legehennen.* R. Fangauf and E. Kallmann, *Archiv für Geflügelkunde*, Vol. 8, 1934, p. 250.

**Summary:**

In an experiment covering 9 months with two Leghorn stocks,  $1/6$  gramme of chloride of calcium was given daily to one group, first of

all in soft food, later on in drinking water. This group consumed somewhat less feed (5,2 %) than the normal stock and yet produced better results than the latter in many respects, through a somewhat greater number and a heavier weight of eggs, there resulted an egg-production higher by 4,8 %; so that the realization figure of 205 against 225 of the normal stock was considerably more favourable, and the chloride of calcium consequently also brought a great surplus of eggs.

The yolk-colour and the final result of the fertilized eggs were somewhat more favourable with this stock. There was no difference in bodily weights.

*Comparative value of some commercial protein supplements in the rations of growing chicks.* O. Johnson and D. Brazie, Jour. Agr. Res. [U.S.], Vol. 48, 1934, p. 183.

Because of the many sources of protein concentrates available, the Washington Experiment Station undertook a study to determine the feeding value of these different concentrates and mixtures of them when used in the chick rations recommended by the college. The same all-mash basal ration was fed to 9 lots of 20 White Leghorn chicks each. This ration was supplemented with the various concentrates and mixtures fed so that the protein level was maintained at approximately 14 percent.

Chicks fed Alaska herring meal made the best growth, those fed Argentine meat scrap the poorest, while those receiving Vico meat scrap, fish shreds, and skim milk powder, or combinations of the various concentrates, were intermediate in growth rate. The biological values were determined for each lot, but could not be associated with other data to show that better growth in some lots was due to better protein ingested made the best growth, but this relationship did not hold in the other lots. The lot making the greatest gain per gram of protein also showed the greatest feed consumption.

*Ca-grit or flintgrit in fattening Cockerels. Die Zugabe von Kalksteingrit und Flintgrit zum Futter bei der Jungmast von Hähnchen.* Dr. K.E. Ferber und H. Brügge-mann, Archiv für Geflügelkunde, Vol. 7, 1933, p. 363.

**Summary:**

Three groups of cocks at an age of four weeks held in batteries were fed with the same mixed feed. The first group was fed normal, the other could take up Ca-grit, while the third got Flint-grit, that is a grit which is absolutely unsoluble. The addition of Flint-grit had the result of saving 15 % of feed in comparison with the normal group. The group with Ca-grit was worst.

## PROTEIN SUPPLEMENTS

*Meat-Scraps and Meatmeal for young Chicks. Diermeel en Vleeschmeel in Rantsoenen voor jonge Kuikens.* W. F. Gerhardt, Ned. Indische Bladen voor Diergeneeskunde, Vol. 45, p. 406, 1933.

**Summary:**

In this experiment taken at the Government Poultry Experiment Station at Buitenzorg (Java) with three lots of 40 chickens and one lot of 39 chickens, which till the age of 108 days were reared with all-mash

rations of various composition as to the animal protein sources, was experienced that the lots which received N.T.F.-animal meal and Hollandia-fish meal in their diets, owing to less efficiency in the use of their food, showed less gain of weight and also less resistance against coccidiosis-infection than the chickens, whose rations contained Liebig-meat meal and Hollandia-fish meal.

On account of these results and various considerations it seems likely to the author that the N.T.F.-animal meal, contrary to the Liebig-meat meal, does not deliver the amino-acids in such quantities as are necessary to furnish with the fish meal and the vegetable proteins the mixture of amino-acids, required for normal growth of young chickens.

*Fish meal supplements for chicks.—III, Comparative growth on rations with pilchard meals.* W. J. Allardyce, W. Henderson, and V. S. Asmundson, Poultry Science, 12, 1933, No.3, pp. 163-166.

Continuing the above studies, four samples of pilchard meal were obtained from three reduction plants and were tested in two experiments by feeding them with a standard all-mash ration to chicks kept in battery brooders. The ash content of the meals varied from 12.8 to 15.3 percent, the protein content from 63.8 to 66.5, and the fat content from 4.7 to 7.5 percent.

The average weights at eight weeks attained by the chicks on the different meals in the two tests were: Meal 1, 551 g; meal 2, 518 g; meal 3, 624 g; and meal 4, 556 g. The chicks receiving meal 3 were significantly heavier than those receiving meal 2. The weight of the chicks varied inversely with the fat content but showed no relation to the protein or ash content of the meals. No relationship was found between the color and texture of pilchard meals and the rate of growth.

*A comparison of fish meal with meat and bone meal for laying ducks.* V.K. Tallent, Harper Adams Util. Poultry Jour., 18, 1932-33, No.8, p. 350.

This study at the National Institute of Poultry Husbandry, England, was planned to determine whether fish meal or meat and bone meal was more economical for egg production in ducks.

There was no significant difference in the egg production of ducks receiving fish meal or meat and bone meal, but because of the lower cost of the latter feed it was much more economical. The ducks receiving fish meal produced a greater percentage of first grade eggs.

*Proportions of meat scraps and dried milk in rations for starting chicks.* R.E. Roberts and C.W. Carrick, Poultry Science, 12, 1933, No.4, pp. 223-225.

The relative value of different proportions of meat scrap and dried milk in rations for starting chicks was studied at the Indiana Experiment Station. The study involved three lots of 98 chicks each fed for a period of 10 weeks on the same basal ration. The meat-and-bone scrap supplement was fed in the respective lots in percentages of 15, 10, and 5, while the dried skim milk was fed in the same amounts in the reverse order.

There was no difference between any of the rations in the rate of growth or mortality during the 10 weeks. The amount of feed required to produce a unit of gain was the same in all lots. The efficiency with which the sexes converted feed into gains was the same during the period from 4 to 10 weeks.

*Protein Requirements of Laying Hens.* J.S. Carver and D. Brazie, in cooperation with the Division of Chemistry and the Western Washington Experiment Station, Puyallup, Agric. Exp. Station, Pullman, Washington, Bull. No.291, Jan. 1934.

Protein experiments are being conducted with 12 lots of hens, housed under commercial conditions. Alaska herring fish meal, meat scrap, skimmed milk powder, and soy bean meal are being studied. The levels of protein used for each protein concentrate are 13, 16, and 18 per cent.

*Protein Requirements of Growing Chicks.* J.S. Carver and D. Brazie, in cooperation with the Division of Chemistry and the Western Washington Experiment Station, Agric. Exp. Station, Pullman, Washington, Bull. No.291, Jan. 1934.

Eight lots of chicks were grown under commercial conditions in these protein balance experiments for a period of 24 weeks. The following four proteins were studied: Alaska herring fish meal, meat scrap, skimmed milk powder, and soy bean meal. The two protein levels used for each concentrate were 13 and 16 per cent. The protein intake and elimination were measured for each lot. The efficiency of growth on each of the several levels and kinds of protein will be determined.

*Poultry Nutrition.* J.L. St. John and Otto Johnson, Agric. Exp. Station, Pullman, Washington, Bull. No.291, Jan. 1934.

Additional information on the method developed by this Experiment Station for the determination of biological value with birds is being published in the Journal of Nutrition showing its application to a ration containing fish meal. On request a paper was prepared for the World's Poultry Congress in Rome and was published in its Proceedings. Results showed that final growth and egg production reach the same level irrespective of the protein level in the feed.

The value of various commercial protein supplements and blends of these in an all mash ration has been studied and the results prepared for publication. Herring meal proved to be the most efficient of the supplements used in promoting growth but other factors beside protein value seem to influence this efficiency.

Additional data have been obtained on the minimum protein requirements of chicks and the effect of different protein levels using herring meal as the protein supplement. A further comparison of additional protein supplements including dry skim milk, soy bean meal, and meat scrap, together with blends of these with herring meal is in progress with chicks and laying hens.

*Casein in layers mash. Kasein im Legehennenfutter.* Dr. R. Fangauf and E. Kallmann, Archiv für Geflügelkunde, Vol. 7, p. 170.

**Summary:**

Equal results brought a comparative feeding of a mash containing 75 % ground feeds with 25 % cod fish meal and another containing 80 %

ground feeds, 15 % dried "casein" and 5 % ground bones. Dried "casein", even taken as the sole protein nutrient, proved to be equal to the other dry milk feeds.

The research of later experiments should show whether dried "casein" can be used only in a mixture with wheat bran (Sweers-method).

The present prices for fish and meat meal make it improbable to use casein in the mash. But the feeding can be recommended when a mash containing 80 % ground feeds with 15 % dried casein and 5 % ground bones costs the same price as a mash of 75 % ground feeds with 25 % fish meal.

*Casein and cod liver oil in layers mash. Die Verwendung von Kasein und Lebertran im Legehennenfutter. I. Zöllner, Archiv für Geflügelkunde, Vol. 7, p. 358.*

**Summary:**

After investigating the growing of chickens by feeding dried caseine in one case and Nopco cold liver oil on the other side in relation to haddock meal, there is worked out another experiment on laying hens with the same three different mashes. As found out before on chickens caseine proved to be equal to haddock meal on hens. However the high price of caseine makes it improbable, to be used generally.

Feeding cod liver oil on hens did not improve the egg production compared with haddock meal.

*Feeding skim Milk. Fütterungsversuche über den Ersatz des Eiweißfutters im Futter der Legehennen durch Magermilch. Prof. Dr. Bünger, Kiel, Archiv für Geflügelkunde, Vol. 8, p. 1.*

**Summary:**

1. Skimmed milk fed to laying hens up to  $\frac{1}{4}$  litre is easily taken and well digested. Thus it is not necessary to buy proteins and the feeding of laying hens can be done by farm grown feed stuffs.

2. Skimmed milk increases the laying results, number and weight of eggs.

3. Body weight and health of the hens is better by feeding skimmed milk.

4. The price of the skimmed milk in these experiments was about 3 Pfennige a litre.

*Feeding Milk as sole Drink. Versuch der staatl. anerkannten Lehr- und Versuchsanstalt für Geflügelzucht des Landesbauernstandes Schlesw.-Holstein, Hauptabteilung II, in Kiel-Steenbek. Dr. R. Fangauf and R. Deditius, Arch. für Geflügelkunde, Vol. 8, p. 13.*

**Summary:**

1. If the birds get only milk as drinking source, they take in the average 250 grams each bird a day.

2. The consumption of laying mash (47 grams) was 8 % less in the groups with milk compared with that with water.

3. The laying results were higher in the milk groups especially

during the summer months, compared with the water groups. The egg weight was higher.

4. An amount of 20 % respectively 10 % proteins in the laying mash did not show better results than the group without proteins or, with other words, the amount of milk was sufficient for the protein level.

5. The body weight of the birds increased by feeding milk as solely drink.

6. The hatchability of the eggs from the water and milk group showed no difference.

7. The price paid for the milk was 3 Pfennige a litre.

*Skim Milk in feeding Poultry. Versuch der staatl. anerkannten Lehr- und Versuchsanstalt für Geflügelzucht der Landesbauernschaft Prov. Sachsen, Hauptabteilung II, in Halle-Cröllwitz. Jaeger, Archiv für Geflügelkunde, Vol. 8, p. 25.*

**Summary:**

The results of the experiments showed that the usually used proteins can be replaced by skimmed milk up to a certain amount. The health of the birds is influenced favourably. The body weight is higher.

The general farmer learns by this that he can use skimmed milk for a good price when feeding to laying hens.

The costs for the production of eggs were highest at the group with a price of 3 Pfennige a litre, of the price should be only 2 Pfennige, the results are better.

*Skim Milk in feeding Poultry. Versuch der Kreisgeflügelzuchtanstalt für Oberbayern in Erding. Dr. L. Weinmiller and K. Voigt, Archiv für Geflügelkunde, Vol. 8, p. 32.*

**Summary:**

With grain and high amounts of skimmed milk together with free runs were obtained the same laying results as with a laying mash rich in proteins. The feeding costs for one egg were too high at the milk group.

*Feeding skim Milk. Versuch der Preuß. und Forschungsanstalt für Milchwirtschaft in Kiel, Versuchsgut Friedrichsort. Prof. Dr. Bünger, Archiv für Geflügelkunde, Vol. 8, p. 39.*

**Summary:**

1. Sour milk (skimmed) fed to laying hens in an amount of  $\frac{1}{4}$  litre daily is easily taken and well digested.

2. The feeding of skimmed milk increased the laying results. The result of the milk groups was 20 % higher than of the water group, which received a protein concentrate (Clubkraft).

3. It is possible to replace the usually fed protein concentrate through skimmed milk. The feeding of laying hens can be defrayed solely by farm grown feeds.

4. The weight of the laying hens is influenced in an advantageous way.

5. Skimmed milk fed in these experiments costs 4 Pfennige a litre.

*Feeding skim Milk. Die Magermilchfrage bei der Hennenfütterung.* Dr. H. Lang, Gießen, Archiv für Geflügelkunde, Vol. 8, p. 65.

**Summary:**

Hens fed by skimmed milk up to 250-300 g each bird a day has following advantages:

1. A full compensation for a part even for the whole amount of the animal and vegetable proteins usually given and also farm grown.
2. With regard to the rentability at least equal to those proteins.
3. Special influence to increase the average laying record per hen, to improve the weight of the eggs, to retard the moult, to raise the bodyweight, and advantages in the health of the laying hens. Also the experiments at Gießen have shown that the group fed by skimmed milk had much better fertility, hatchibility, and less mortality during the rearing season.

*Milk Products for Poultry.* E. T. Halnan, Farmer and Stock-Breeder and Agric. Gaz. 1933, 47, 2281.

A popular article on the value of milk and its by-products for poultry feeding. From consideration of the analyses of these products, it is pointed out that the difference between skim milk, whole milk and buttermilk powders resides chiefly in their fat content, and that from a protein standpoint these three products are approximately equivalent. Dried whey and condensed whey are also regarded chiefly as sources of sugar and mineral salts. Milk products are shown to confer a resistance to coccidiosis, to have a favourable effect on the growth of young chicks, and to be of value for inclusion in fattening mixtures.

*Effect of milk products on pH of intestinal contents of domestic fowl.* D. W. Ashcraft, Poultry Science, 1933, p. 292.

A series of studies was carried out at the Ohio Experiment Station to determine the effect of diets containing various amounts of milk products on the pH concentration of the contents of the intestinal tract of the adult domestic fowl. The basal diet contained 20 percent of meat scrap, and the experimental diets 20, 40, 28, 40, and 20 percent, respectively, of dried buttermilk, dried buttermilk, Kraco (a dried whey), dried skim milk, and lactose. The experimental procedure consisted of diluting the contents 1:4, comminuting, centrifuging, and testing the supernatant fluid by electrometric methods.

The pH of the duodenum and ileum content was increased, while that of the cecal content was markedly decreased, by use of milk products. Feeding these products changed the cecal contents from a characteristic firm, brownish, pulaceous mass to a yellow, creamy, frothy mass, and the cecal horns were distended two to three times normal size. A decrease in the pH of the contents of the large intestines was noted, particularly with the rations containing Kraco, dried skim milk, and lactose. On the basis of their ability to lower the pH of the ceca and the large intestine contents, the experimental rations ranked as follows: 6, 5, 4, 3, 2, respectively. Birds fed Kraco showed a persistent diarrhea and loss of weight, and the dried skim milk and buttermilk diets produced slight diarrhea.



*The position of dry skim milk in poultry feeding.* C. W. Sievert, U. S. Egg and Poultry Mag., 39, 1933, p. 42.

In this study, conducted at a large poultry-fattening plant, dry skim milk, condensed buttermilk, and condensed cultured skim milk were compared as to their value in a poultry-fattening ration.

It was found that dry skim milk was comparable with other milk sources on the basis of milk solids contained as a source of milk for poultry fattening. The gains produced and the feed consumption were comparable in all lots. The quality of the poultry produced by feeding dry skim milk was equal to that produced by other forms of milk.

*Storage of Curds for use as Poultry Food. The Preservation of Skimmed Curd for Poultry Feeding.* Davis, Journal of dairy Science, Vol. 16, 1933, p. 495.

The object of the experiments was to find the best method of storing curds for long periods and to establish the length of time they could be kept. Three kinds of conservative were tried. The test mixture was tried in various proportions. Formalin was the best. 1:1000 formalin was added to the curds and this mixed very well. Well soured curds covered with whey or formalin was kept good for 185 days. The only disadvantage observed was a slight discoloration. Curds conserved in this way can be fed to hens and chickens without any danger.

*Ground soybeans as a protein supplement for growing chicks.* A. E. Tomhave and C. W. Mumford, Delaware Sta. Bul. 183, 1933, pp. 24, fig. 1.

Continuing this study, it was concluded that ground soybeans supplemented with bone meal could not be used to replace all of the animal protein in a ration for growing chicks without affecting the growth, mortality, and feed requirements per unit of gain. However, when supplemented with bone meal the ground soybeans could replace one third of the meat scrap without affecting these factors. Ground soybeans were less palatable than meat scrap containing 55 percent protein. When a unit of protein in ground soybeans and in meat scrap cost the same there was no advantage in feeding the vegetable protein, but when the cost was 65 percent or less for the vegetable protein it could be used economically to replace one third of the meat scrap.

*Grain and skimmilk versus grain and mash for egg production.* O. S. Willham, Oklahoma Panhandle Sta., Panhandle Bul. 52, 1933.

Continuing previous investigations, four lots of 25 pullets each were fed for one year. Three of the lots were fed as in the previous test, while the fourth lot received a ration made up largely of home-grown feeds with half the meat scrap left out and with skim milk kept before the birds at all times.

The pen fed grain and skim milk produced about 7.5 percent more eggs and had a margin over feed cost of about 26 ct. per bird more than any of the other pens. Feed cost per dozen eggs ranged from 4.42 ct. in the pen receiving grain and skim milk to 7.33 ct. in the pen receiving the station laying mash. The grain and skim milk pen did not react to changes in weather so much as the other pens. There was no significant difference in the production in the pens receiving mash. The mortality

ran high and there was evidence of internal parasites in all pens. Because of the abnormal weather conditions under which the test was conducted, such as cold, dust storms, and drought, it is stated that too much confidence should not be placed in the results.

*Oilcake meal as a partial Compensation for Fishmeal. Ölkuchengemisch als teilweiser Ersatz für Fischmehl.* Dr. Fangauf and E. Kallmann, Archiv für Geflügelkunde, Vol. 6, p. 353.

**Summary:**

1. The consumption of feed increased with higher amounts of a mixture of oilcake meals in the ration.

2. The egg production per hen was highest at a medium amount of oilcake meal in the ration. The flocks with low and the highest amount of oilcake meal showed no difference in egg production.

3. The relation of feed consumption to egg production was best at a medium ration and less satisfactory both at a lower and at a higher amount of oilcake meal in the ration. The difference was not very significant.

4. The egg weight at the highest amount of oilcake meal in the ration was somewhat less than at the low one. The variation lies within the mean fault.

5. The difference in yolk colour was not very significant; it was somewhat better than at the normal ration with animal protein.

6. The hatching result of the three flocks was very high, best in the group with the highest amount of oilcake meal in the ration.

7. The financial calculation had no fixed result. We might assume, that an amount of oilcake meal higher than 50 % of the protein-ration is not profitable as long as the price for oilcakes is still lower than half the price of fish meal or meat meal.

8. The experiments confirm again that feeding a mixture of 50-60 % oilcake meal in the protein ration brings good results with regard to egg production. Regarding the relation of high prices for grains to low prices for eggs in Germany, the feeding of oilcake meals can be recommended as a partial compensation for grain.

*Digestion experiment of soy bean cake and kaoliang with poultry.* K. Suzuki, Bul. Agr. Chem. Soc. Japan, 7, 1931, Nos. 9-12, pp. 82-84. (Ref. Exp. Station Record, 1934, p. 78.)

Digestion trials with 2-year-old White Leghorn cocks at the Imperial Zootechnical Experiment Station, Chiba, gave the following average digestion coefficients for soybean cake and kaoliang: Organic matter, 67 and 75.3 percent; crude protein, 84.8 and 22.4; crude fat, 91.8 and 65; crude fiber, 2.2 and not given; nitrogen-free extract, 40.7 and 85.9 and pure protein, 90.7 and 27.5 percent.

*Experiments with vegetable Proteins. Versuche über die Verfütterung von pflanzlichem Eiweiß an Legehennen.* L. Macrander, Archiv für Geflügelkunde, Vol. 8, p. 162.

**Summary:**

The results of the experiment may be summarized thus:

Neither the feeding with only a vegetable albumen foodstuff nor the, in part, very high doses of vegetable albumen, hindered the develop-

ment of the young hens; the increase in weight was good and uniform in all groups; (compare table 2 and graph 2 a). After six months the hens began laying, and their output increased rapidly in a satisfactory manner. (Compare table 7 and graph 7 a.)

As to increases in weight, the feeding with soja bean extraction groats gave a better result than with the same quantity of earth-nut cake meal (tables and graphs 2, 2 a and 5, 5 a); with egg laying, the soja bean groups also show a better result than the parallel earth-nut groups (table and graph 7 and 7 a).

The sections receiving a mixture of soja bean extraction groats and earth-nut cake meal did not show a more favourable result as to increases in weight than their parallel sections receiving only a single vegetable albumen fodder; on the other hand, with egg laying, they are the most favourable of all the parallel sections.

The somewhat cheapening of the foodstuffs or of the production of eggs through increased use of vegetable albumen may again be neutralized by increased food consumption (compare tables and graphs 3, 3 a and 9).

The very high vegetable albumen doses of group 3 appear to cause a quicker reaction of the birds to weather influences and the like; production can be influenced in this way (compare table and graph 7, 7 a). The rich vegetable albumen feeding did not harm the brood. Like the parent birds, at the various weighings, the chickens of the soja bean section consistently showed somewhat higher weights than those of the earth-nut sections (compare table 11).

The chickens of all the experimental groups were fed and reared uniformly.

No noticeable difference in the development of the chickens in the single groups was observed.

Consequently, with approximately the same prices for the same weights of foodstuffs, soja bean extraction groats are to be preferred to earth-nut cake meal as the results are better in every way.

From the outcome of this experiment, vegetable albumen in the form of soja extraction groats and earth-nut cake meal may be very well considered as the only albumen addition in a feeding mixture for laying hens and, even with high doses, is not injurious to their health and laying capacity.

## GRAINS. POTATOES

### *Rye as Poultry Food.* Schmidt and Lauprecht, Biedermanns Zentralblatt für Tierernährung 6 H/H.

A comparison was made between two rations given to Leghorns, of which the food value was practically similar. The only difference was that one contained 25 % of wheat meal and the other a similar quantity of rye meal. The food was given to 2 groups each consisting of 149 American White Leghorns of the same strain and the same hatching, which were reared together.

The consumption of food, the number and weight of the eggs laid was somewhat smaller in the rye-group. Calculated on 100 kg starch-value the egg production was equal in the two groups. No unfavourable results were observed after the feeding of rye.

The result of this experiment proves that rye is of no less value than wheat in mixed feeds.

*Investigations on the digestibility of the crude fiber of the different kinds of barley by poultry.* H. Stotz and H. Brüggemann, Arch. f. Geflügelk., 7, 1933, No. 7, p. 202.

Digestion trials with Rhode Island Red hens fed 10 different varieties of barley were conducted at the Institute of Animal Physiology of the Agricultural High School, Berlin. The digestibility of the crude fiber of barley varied widely and depended upon the variety fed. There was no characteristic difference in summer and winter barley. The results suggested that in determining the digestibility of this nutrient of barley for poultry it should be calculated for every variety.

*Wheat v. Oats in a Laying Mash.* Journal of the Ministry of Agriculture, April 1934.

Recently the price of wheat has been low while the price of oats has risen to a relatively high level. On farms where ground oats have to be purchased for inclusion in the laying mash, an economy can be effected by substituting wheat meal for ground oats. Some time ago the usual laying mash employed on the Institute farm was altered in order to take advantage of the fact that wheat was cheap, and to make the adjustment necessary on account of the difference in composition between the new weatings and the old sharps. The alteration has proved entirely satisfactory and has resulted in a saving of about 14 s. per ton. Both mixtures are given below:—

New Mixture.	Old Mixture.
10 per cent. fish meal	10 per cent. fish meal
20 per cent. weatings	30 per cent. sharps
30 per cent. bran	20 per cent. bran
20 per cent. wheat meal	20 per cent. Sussex ground oats
20 per cent. maize meal	20 per cent. maize meal

Plus 1 lb. salt and 2 lb. cod liver oil per 100 lb. of the mixture.

The mash is given in conjunction with a corn mixture consisting of equal parts (by weight) of wheat and kibbled maize.

*Oats and sprouted Oats. Hafer und Keimhafer als Hühnerfutter.* Dr. L. Weinmiller and K. Voigt, Erding, Archiv für Geflügelkunde, Vol. 7, p. 302.

**Summary:**

Six groups were fed with dry mash, containing 30 % concentrate (Clubkraft) and 70 % carbohydrates. At 3 of these groups ground oats and rye were taken as carbohydrates (cheaps dry mash) and at the remaining 3 groups ground wheat and barley preferred (dear dry mash). Two groups, each one with cheap and the other with dear dry mash received wheat, two other groups oats and two groups sprouted oats, sprouted for 4 days. The best success brought the two groups with sprouted oats, the second place had the wheat-groups and the last place had the two groups with dry oats as grains. They showed only 85 % of the production of the two groups with sprouted oats. Therefore oats should be fed only sprouted.

*Rice and rice by-products as feeds for laying hens.* C. W. Upp, Louisiana Sta. Bul. 243, 1933, p. 32.

A series of five feeding tests involving 32 different lots of White Leghorn pullets was conducted to determine the value of rice by-products for poultry.

It was found that the rice byproduct rations compared favorably with the check ration in producing winter eggs and in annual production. None of the products used were distinctly detrimental to egg production, length of the productive period, hatchability of eggs, egg weight, or body weight. Rough rice was a nutritious, palatable grain for birds which, when ground, could satisfactorily make up 40 percent of an all-mash ration. Rice bran either heat-treated or untreated could be used to replace wheat bran or pulverized whole oats, or wheat bran and wheat shorts, or part of the yellow corn meal in laying rations. The percentage of free fatty acids present in rice bran after several months' storage was not diminished by heating to 140° F.

Brewers' rice at 18 to 55 percent levels could be successfully used to replace oats, wheat, or corn in the scratch grain, or part of the yellow corn meal in an all-mash ration. Rice polish was a satisfactory substitute for ground oats, wheat shorts, wheat bran, or both bran and shorts in laying rations. Various combinations of rice bran, rice polish, and brewers' rice were successfully substituted in the chick ration with good results. Eggs produced on rice rations were of good quality and kept well in storage.

At 12 weeks of age, chicks from rice-fed dams were as large as chicks from the check diet. A comparison of egg records showed that birds that died during the year were poorer layers than those that survived.

### *Rice By-products in Poultry Rations.*

In some of the southern states rice by-products are readily available at reasonable prices, and it is important to know to what extent they may be used in poultry rations without having an unfavorable effect on the fowls. A summary of five years' work on this problem, recently issued from the Louisiana Agricultural Experiment Station, includes the following statements:

1. Rice-fed hens produced as well as hens on standard rations when rice by-products comprised up to 25 per cent to 35 per cent of the total ration.

2. Rice bran (of good quality) or rice polish, or the two together, may be used to replace wheat by-products, ground oats, or not to exceed half of the yellow corn meal in laying mashes.

3. When cheaper in price, rough rice or brewer's rice may replace wheat or corn to the extent of one-third to one-half of the scratch grain.

4. The eggs from rice-fed hens are excellent for market and they keep well in storage.

5. The eggs from rice-fed hens are as large as eggs from hens fed standard rations.

6. The use of rice by-products in the rations of breeding birds does not impair in any way the fertility or the hatching quality of the eggs produced.

7. Mortality is no greater in lots fed rice rations than in other lots kept under similar conditions but with no rice by-products in the ration.

8. The body weight of laying hens receiving rice by-products in the ration compares favorably with that of hens receiving no rice by-products.

*Poultry Studies in Arkansas.* R. M. Smith, Arkansas Sta. Bul. 268, 1931, pp. 42-44.

*The value of rice by-products for laying hens.*

This test was undertaken to determine to what extent yellow corn meal could be included in a rice ration and adequately substituted for

the cod liver oil supplement. The results on the basis of production, hatchability and fertility indicated that the quantity of yellow corn necessary must be considerable.

*The value of rice by-products in the growing ration.*

In this test a check ration composed of 30 per cent of yellow corn meal, 25 per cent of wheat middlings, 25 per cent of wheat bran, 10 per cent of meat scrap, 5 per cent of dried buttermilk, 3 per cent of bone meal, 1 per cent of salt, and 1 per cent of cod liver oil with scratch feed made up of finely cracked yellow corn, and a rice ration consisting of 40 per cent of rice bran, 40 per cent of rice polish, and the remainder of the ration as above, were fed in three tests to White Leghorn, Barred Rock and White Leghorn chicks, respectively. At the end of eight weeks the chicks in the check ration lots averaged 512, 623, and 543 gm. and those in the rice ration lots 540, 537, and 501 gm. per head, respectively. While the rice ration was not as palatable as the corn ration, it promoted normal growth and health of chicks during eight weeks of brooding.

*The influence of mineral, cod liver oil, alfalfa leaf meal, and sprouted oats on the production, hatchability, and fertility of eggs.*

The basal mash used in this study was supplemented in the six pens as follows: Pen 1, no supplement; pen 2, minerals; pen 3, cod liver oil; pen 4, alfalfa leaf meal; pen 5, sprouted oats; and pen 6, alfalfa leaf meal and sprouted oats. The percentage egg production in the respective lots was 43.9, 34.4, 46.3, 44.5, 49.2, and 40.6, the percentage fertility 95.3, 97.2, 95.5, 91.1, 95.1, and 94.3, and the percentage hatchability 86.1, 73.4, 76.1, 86, 79.2, and 88.8. The sprouted oats was the only supplement that gave a profitable increase in egg production, while none of the supplements appreciably increased the fertility or hatchability of the eggs produced.

*Eosin-Wheat and the Health of Poultry. Gesundheitsschädigungen nach Verfütterung von Eosinweizen. F. Wagner, Süddtsch. landw. Tierzucht 27, 401, 1933.*

Short review concerning the feeding of eosin-wheat to poultry. No harmful results followed. In normal feeding a hen can consume  $2\frac{1}{2}$  mg eosin in wheat within two months while a 1000 times bigger mixture could be harmful. The harmful results recently observed do not appear to have been caused by the eosin but by the cockle-seed among the wheat.

*Potatoes in the Ration for Laying Hens. A. Wehner, Arch. f. Geflügelk., 1933, 7, 289-295.*

Experiments on 2 groups each of 15 Leghorn hens, of which one received a good laying ration and the other a protein concentrate and steamed potatoes, showed that potatoes may replace the more costly cereal starch without reducing egg yield or weight of the hens. Potatoes are, however, not recommended for the production of eggs for hatching, since hatchability seemed to be lower where large quantities of potatoes were fed.

*Effect of Cotton Seed Diet on the Composition of the Egg. V.G.Heller, V.Searcy, and R.B.Thompson, Proc. Oklahoma Acad. Sci., 1932, 12, 45-52.*

On storage,  $H_2O$  passes from white to yolk. Eggs from gossypol-fed hens have viscosity and coefficient of spread, but not an olive colour,

similar to those of eggs of hens fed on cotton seed meal. For the latter, pH, H<sub>2</sub>O, fat and protein contents, N distribution, and I value of yolk fat were normal.

*Fattening Cockerels. Junghähnchenmast mit einfachen Magermilch-Schrotgemischen unter besonderer Berücksichtigung des getrockneten Zuckerrübenschrotes.* K. E. Ferber and M. Chodziesner, Biedermanns Zentralblatt, Vol. 5, 1933, p. 639.

400 birds were used for the test. Only fattening foods containing five ingredients were given Skimmed milk-oilcake mixture is recommended as albumen food during the first four weeks of fattening. The following food is recommended: 40 % dried sugar-beets, 30 % sunflower-meal cake, 28 % crushed barley, 2 % calcium  $\pm$  2 Ltrs. full acid skimmed milk per kg mixture. The nutritive proportion of this food is 1: 3. It is only after the birds are 8 weeks old that it is possible to use crushed grain in the mixture, with full acid skimmed milk as the only albumen food, as the nutritive proportion that can be obtained herewith is too limited for younger birds. 1: 4.3 has already proved to be too large a proportion; from the beginning of the second four weeks it is quite sufficient. On the basis of their experiments the authors concluded that in the fattening food up to 50 % dried sugar-beetslices can be used which however must be cut extremely small. Their food value is equal to that of crushed barley; in price they compare favourably. These experiments have again proved that the fullest value has been obtained from fattening food by the end of the 12th week of life.

*Potatoes in Layers Mash. Kartoffeln im Legehennenfutter.* Dr. A. Wehner, Archiv für Geflügelkunde, Vol. 7, p. 289.

**Summary:**

Steamed potatoes proved to be a good feeding base for poultry feeding. It is possible to replace by these the expensive carbohydrates of cereals and to make cheaper the feeding of laying hens. Neither the laying ability nor the body weight are influenced. The feeding of these potatoes to breeding flocks can not be recommended, as it seems that the hatching eggs lack vigour.

*Potatoes for laying Hens. Zur Frage der Kartoffelfütterung an Legehennen.* Dr. G. Bienko and A. Liersch, Archiv für Geflügelkunde, Vol. 7, p. 261.

**Summary:**

Steamed potatoes may be fed on laying hens instead of cereals (Maize). The feeding costs are lower.

## SUNDRIES

*Chick Feeding Experiments.* H. F. Newbigin and R. G. Linton, Scottish Journal of Agriculture, Vol. 14, p. 186.

The experiments were carried out for the purpose of determining the relative value of complicated and simple grain mixtures for growing chicks, the influence of skimmed milk on the growth and to determine

the resulting egg-production. Of 4 groups each containing 22 chicks 2 groups received a complicated (and dear) grain mixture, the other two a simple (and cheap) grain mixture. The grain mixture of groups I and II consisted of equal parts of durra, millet, canary-seed, split-lentils, split-peas, split-rice, groats, crushed maize, crushed wheat and hemp. Group I received as much skimmed milk as they desired; group II water. The grain mixture for groups III and IV consisted of equal parts of groats, crushed maize and crushed wheat. Group III received as much skimmed milk as they desired, group IV water. All groups received a free ration of finely ground oyster shells and green-fodder. The experiment was carried out in four periods. During the first period, which lasted 56 days, the groups received the rations mentioned, during the second period, 60 days, the food was changed and all received a mixed food in the proportion of crushed wheat 60, crushed maize 20, crushed oats 20, ground oyster shell 2, steamed bonemeal 1 and salt 1, but the milk and water rations remained the same during this period. During the 3rd period (31 days) the milk was not given. The 4th period, the period in which the egg production was to be controlled, lasted 12 months.

During the first period the chicks which were allowed as much skimmed milk as they desired, progressed better than the water group. The latter made a very poor impression. The skimmed milk group ate almost double the amount of food consumed by the water group, but the increase in weight per unit of the first group was much less, as compared with the quantity of food consumed. In this respect the difference between groups I and II was much greater than between groups III and IV. At the age of 4 weeks the chicks in groups I and II developed leg weakness. The chicks in groups III and IV would also have been affected in this way had they not been given cod-liver oil when the first symptoms of the sickness appeared. As regards the growth of the chicks during the first period, the results for those that received the complicated mixture were no better than those of the simple mixture. On a free grass range the water chicks eat much more grass than the skimmed milk chicks.

The change of food in the 2nd period caused a more rapid growth of the chicks in all groups, but especially those of the water-groups. The improvement in growth was attributed to the action of the kitchen salt and bonemeal given in the ration. The absence of milk in the 3rd period caused a remarkable falling off in the growth of the original skimmed milk chicks (group I and group III). There was no pause in the growth of the chicks in groups II and IV (water-groups). At the beginning of the lay a further retardation of growth occurred in the original skimmed milk group.

From the beginning of the lay the following dry mixture was fed: crushed wheat 50 parts, crushed maize 20, crushed oats 10, lucerne 10, and fishmeal 10 parts. As regards egg production and the size of the eggs there were no differences of statistical importance between the various groups. It is true that the average production of the original skimmed milk groups was somewhat higher but the eggs were rather smaller.

As the chicks of the water groups showed a better state of general health during the 3rd and 4th period, the authors are of opinion that it is not advisable to continue with the milk feeding too long. The greatest value from milk feeding is obtained during the first 4 or 5 weeks after hatching.



*Cane molasses in poultry rations.* C.M. Bice, Hawaii Sta. Bul. 67, 1933, pp. 16, figs. 15. (Ref. Exp. State Record, Vol. 70, 1934, p. 227.)

The results of a series of tests showed that when fed in amounts not to exceed 7 percent of the mash ration cane molasses was a satisfactory feed for chicks and for growing pullets and cockerels. It did not, however, prevent coccidiosis in baby chicks. In fattening rations for broilers, feeding 5, 10, and 15 percent of molasses resulted in economical gains, but with hens in fattening batteries it was inefficient.

*Digestibility of Wood in Poultry. Versuche über die Verdaulichkeit von Futterstoffen aus Holz beim Geflügel und Wiederkäuer.* Prof. Dr. E. Mangold, H. Brüggemann and E. Theel, Agricult.-High-School, Berlin, Landwirtschaftliche Jahrbücher, Zeitschrift für wissenschaftliche Landwirtschaft, Vol. 78, 1933, p. 649.

The digestibility in poultry and sheep of preparates of wood prepared by Prof. Dr. E. G. Schwalbe was examined. The preparates were made of beech- and pine wood and bark. In some cases the digestibility amounted to 40 % and in exceptional cases to 48 %. The digestibility of rye straw rose from 0 % to 13 %.

*Digestion Experiments with artificial anus. Stoffwechselversuche bei Hühnern mit künstlichem After,* W. Maas, Archiv für Geflügelkunde, Vol. 7, p. 225.

**Summary :**

a) It was proved that it is possible to use hens with an "Anus præternaturalis" for digestion experiments as long as you wish.

The birds cut by method of Klein can secrete urine and excrements at the same time and immediately. There are never stowings of excrements.

b) The feeding experiments on hens with rye proved that rye is very useful for young birds as well as for grown stock and not at all damaging the organism of the birds. Birds fed on wheat had always a light comb, light wattles light colour of feet and beak. Birds fed rye showed in a short time red combs and red wattles. The colour of feet and beaks was deep yellow. The litter of peat moss seemed to have an influence on the health of the birds.

*Digestibility of crude Fibre of Barley. Untersuchungen über die Verdaulichkeit der Rohfaser verschiedener Gerstensorten bei Hühnern.* H. Stotz and H. Brüggemann, Archiv für Geflügelkunde, Vol. 7, p. 202.

**Summary :**

We have performed feeding experiments on Rhode Island hens with 10 different sorts of barley for knowing the digestibility of food stuffs and especially to find out, whether and to what degree the crude fibre of barley is digestible by poultry.

It has been examined, whether the great differences in the digestibility of the barley crude fibre, that were observed in former feeding experiments, are caused by the differences of sorts.

We stated, that the digestibility of barley crude fibre in poultry is

a matter of sorts and can be a bad one, median or good one and that, while it is missing at all in some sorts, in other sorts it is reaching 20—30 %, so that in such cases the digestible part of the crude fibre of the fedded barley must be calculated in the calculation of food requirement and application in hens.

There was no characteristic difference in summer- and winter-barley, since we had sorts of both, on that we could state a bad, median on good digestibility of crude fibre in hens.

*Influence of Grit. Über den Einfluß des Grit auf die Nahrungsaufnahme der Hühner.* E. Mangold and H. Rüdiger, Archiv für Geflügelkunde, Vol. 7, 1933, p. 295.

**Summary:**

It was shown by experiments on Rhode Island hens, that there is no alteration of appetite and food consumption, if the animals are not supplied with grit for some weeks. Such an influence is not to be expected, because in such cases there is a retention of grit in the poultry stomach for some months.

*Digestion Experiments with Hens. Quantitative Verdauungsversuche am Haushuhn.* H. Engler, Institut für Haustierernährung, Zürich, Biedermanns Zentralblatt, Vol. 5, 1933, p. 329.

The experiments were carried out on Leghorns and Rhode Island Reds. The following were tested: Platacorn, cod meal, linseed meal and a corn product (maize na). The degree of digestibility of the crude protein, crude fibre and free extracts of the products is less in hens than in cows, horses and swine. Crude fibre is the easiest to digest.

*Digestibility of Fats by Birds. Etude sur le Métabolisme des Lipides chez les Oiseaux.* C. Tarlazis and E. Dimitropoulos. Annales de Médecin Vétérinaire, Vol. 78, 1934, p. 462.

The proportion of fat in the food and the faeces was investigated. In one case 61 % digestibility was found and in the other 79,53 %. The authors were of opinion that the digestibility of fat depends on the kind of food given.

*Some Aspects of Fat Metabolism in Fowls and their Practical Significance.* E. T. Halnan and E. M. Cruickshank, Proc. 5th World's Poultry Cong. Rome, 1933, Paper No. 54.

This paper consists of a considered statement of the work of the Poultry Nutrition Section of the Animal Nutrition Institute on fat metabolism during the period 1924-1933. It is shown that the cockerel and pullet show marked differences in their relative capacities to store fat during growth, and that a close qualitative relationship exists between the fats contained in a ration and the fats stored in the body of the fowl. By including fats of different character in the fattening ration it thus becomes possible to alter the succulence, flavour and cooking qualities of the carcass. A difference between the alteration in the body fat and the yolk fat, caused by inclusion of fat in the food, is shown to exist.

Whereas the body fat is affected by fats consisting largely of either saturated fatty acids or unsaturated fatty acids, the yolk fat is affected to a marked extent only by fats containing unsaturated fatty acids. Thus hemp oil and mutton fat both affect the body fat composition, but whereas hemp oil affects the yolk fat composition, mutton fat does not.

*Observations on the Feeding of different Fats to Poultry.*

E. M. Cruickshank, Agric. Progr., Vol. II, 1934, p. 147.

A popular article indicating the extent to which body fat and egg fat may be influenced by ingested fat.

*Some Observations on the Formation of Fat in the Fowl.*

E. M. Cruickshank, Essex Agric. Comm. Reg. of Egg Records, 1932-33, p. 9.

A popular article dealing with the fattening of table poultry.

*Recent Research Work in Poultry Nutrition.* E. M. Cruickshank, Harper Adams Utility Poultry J., 1932, 17, 626.

This paper refers to the work at present being carried on in Cambridge on the fat metabolism of fowls. The problems under investigation are:—

1. What is the nature of the fat deposited in the body and in the egg from the normal cereal rations?

2. Is fat from the food transferred to the body fat and the egg without change? If this is so, the quality and nature of both the carcase and the egg will be affected by feeding.

It has been found that the nature of the food will influence considerably the composition of the body fat; the ingestion of fats, either animal or vegetable, of low iodine value, i. e. saturated fats, will lower the iodine value of the body fat considerably, while the feeding of unsaturated fats, e. g. hemp seed oil, will raise the iodine value.

In the case of the egg it has been found that fats of a highly unsaturated nature can be readily introduced into the yolk making the yolk fat more unsaturated than normal. On the other hand it seems very difficult to make the yolk fat more saturated than normal. The possible relationship of this fact to hatchability is briefly discussed.

*The Work of the Poultry Nutrition Research Institute, Cambridge.* E. T. Halnan, Agric. Prog. 1934, XI, 144.

This article is a summary of a paper read before the Agricultural Education Association at Cambridge in July, 1933. Feeding standards for British breeds of poultry on grass runs are included, these standards being based on the results of an investigation carried out in conjunction with J. W. Dallas, Agricultural Organiser for Bedfordshire.

*What Judgment does a hen use in Selecting her Food?*

L. Banta, Massachusetts State College, Amherst, Poultry Science, Vol. 9.

The acquisition of a New Hampshire type hen battery suggested the excellent opportunity which this equipment afforded to study individual variability in the self or free-choice of laying ration constituents. This battery unit was devised for thirty-six hens, but the use of a specially-designed feeder with compartments for thirteen feedstuffs

precluded such small units, so the centre partitions were removed, and eighteen Rhode Island Red yearling hens were employed. Cod liver oil was administered individually. Each bird had a space 16 inches by 36 inches and 17 inches high. The battery provided running water, and was placed in an artificially-lighted room, which was heated during cold weather. A fresh supply of feed was furnished daily, as required. Uniform periods of 28 days each were used.

The data for six periods from January 2 to June 17 (inc.), 1932, show the following proportions of the ingredients of the New England College Conference ration were consumed:

Yellow corn meal . . . .	34.4 %	Mica grit . . . . .	1.97
Whole wheat . . . . .	19.92	Fish meal . . . . .	1.37
Cracked yellow corn . . .	15.58	Meat scraps . . . . .	.84
Wheat bran . . . . .	15.14	Dried skim milk . . . . .	.79
Standard wheat middlings	3.63	Alfalfa leaf meal . . . .	.07
Oyster shell . . . . .	3.21	Sodium chloride . . . .	.05
Ground oats . . . . .	3.01		

### *Experiments with the Fattening of Cockerels. Mastversuche mit Hähnchen.* Büniger and Werner, Archiv für Geflügelkunde, Vol. 7, p. 33, 1933.

The authors report on experiments carried out in 1930 and 1931. The experiments dealt with the question of the economy of addition of milk to dry fodder with 20 % albumen, when fattening cockerels, and further with the substitution of albumen in dry fodder by milk. In the first experiment, for which 227 Leghorn cockerels were used Habu skimmed milk, buttermilk or curdled milk were added to crushed grain with a 20 % albumen content. In the 5th group water was given instead of milk. At the beginning of the experiment the increase in the weight of the milk-group was on the whole somewhat higher than that of the water-group. During the second part of the experiment this decreased continually. A saving in crushed grain by the addition of milk was scarcely noticeable. Diarrhea caused considerable losses and this influenced the total results of the experiments. A fact worthy of mentioning in connection with this experiment is that the proportion of nutritive food was not levelled, which is usual, but the proportion of albumen to the total of nutritive food. The manner in which the consumption of dry fodder was calculated is exemplary; all the food was reduced to food with a uniform dry content of 85 %. The dry food mixture which the milk absorbed varied between 3,5 % and 6,8 % of the total food, the highest figure being for fresh buttermilk and the lowest for Habu. As the mixed food was already rich in albumen and the addition of milk had no special influence on it, it will be easily understood that the total cost of food per bird in the milk group was higher than in the water-group and that the addition of milk is not economic.

The second experiment was carried out with 60 Leghorn cockerels, of which one group received fish-meal-meatmeal and the other curds as albumen food. Part of the birds were kept in runs other in houses without runs. The curds were not eaten with relish at first but the birds suffered no ill results. The fishmeal-meatmeal group were 9 % better than the curds group and in both groups the birds kept in runs were 4 % better than those kept in hen-houses. The utility figures for the run-birds was 218 for the fishmeal-meatmeal group and 248 for the curds-group and from 235-254 for the hen-house birds.

A further experiment was carried out with 73 Rhode Island

cockerels which at 9 weeks old weighed 670 gr. and were to be fattened to 1000 gr. One half were given crushed grain and curds the other soya beans and sometimes crushed soya beans with milk. The daily increase in weight of the soya group and that of the soya-milk group as compared to the curds group amounted to 77 % and 80 % respectively. The utility figures were 519 for the curds group, 369 for the soya group and 333 for the soya-milk group.

As a result of these three experiments the authors concluded that the substitution of milk food for fishmeal-meatmeal leads to increased cost.

*Range Fattening of Ducks, Geese and Turkeys. Weidemast bei Enten, Gänsen und Puten.* R. Fangauf and E. Kallman, Archiv für Geflügelkunde, Vol. 7, p. 109, 1933.

In the experiments comparisons were made between the increase of weight in range fattening and in quick fattening. In the first experiments ducks were kept on an unbounded pasture and on oat stubble. Coarse crushed maize, and later oats, were given as by-foods. The birds had free entry to a thickly overgrown pond which was eaten bare. The weight of the birds increased quickly, the average limit weight of 2425 gr. being reached at the age of 13 weeks. This is somewhat later than in quick fattening but the cost was not so high.

In a second experiment 4 weeks old geese were turned on to pasture land in a similar way. During the first 8 weeks of the experiment the average increase in weight was 3004 gr. after which a pause occurred. The food picked up on the range appears only to have helped to keep up this body weight. The final fattening can apparently only be carried out by feeding grain. During a quick fattening experiment carried out at Steenbeck the increase during 7 fattening weeks amounted to 3787 gr. The results of feeding albumen in goose fattening can be measured if the two figures mentioned above are compared.

The last experiment dealt with the range fattening of turkeys which could not be given any kind of additional food and therefore had to be given grain. The birds were 7½ weeks old when the experiment, which lasted 20 weeks, was commenced. At the end of the range fattening 14 days grain fattening was carried out, equal parts of grain and potatoes being given. In the 20th fattening week the average increase was 4054 gr. Growth was regular up to the 18th week when a pause occurred which was remedied by the feeding of grain. As in the experiments mentioned above the cost of feeding showed a very favourable balance. As only a small portion of food consumed could be visualized no utility figures were compiled. In the summary it was concluded that the increase obtained in range fattening is not far behind that of quick fattening. Good increase can be obtained when range conditions are favourable. Fangauf states, and quite correctly, that quick fattening is only possible when the termination of such fattening coincides with a favourable market. If no such market exists and good range spaces are handy then range fattening is preferable.

*Experiments in fattening with palm oil in lieu of mutton fat.* C. E. Fermor, Bul. Imp. Inst., London, 1933, p. 390. (Ref. Exp. Stat. Record, Vol. 71, p. 233.)

In experiments at the South-Eastern Agricultural College it was found that when birds of a white flesh variety were fed the same basal ration, the color of the flesh was not affected if one group received

mutton fat and the other group palm oil. It was found that there was no appreciable difference in the gains produced by the two feeds.

*Fattening young geese on cut sugar beets, molasses mixed feeds, and milk.* K. E. Ferber and M. Chodziesner, Arch. f. Geflügelk., 7, 1933, No.6, p. 177.

In a study at the Institute for Feeding Technic, Breslau, Germany, it was found that dried sugar beets could be used to make up a large part of the ration for fattening green geese if skim milk and young clover or alfalfa were also used. A ration of dried sugar beets, wheat bran, and ground oil cake fed to geese on green forage gave satisfactory results. Molasses feeds could also be used when fed with ground oil cake to geese receiving liberal amounts of young clover and alfalfa.

*Turkey feeding experiments.* [Connecticut] Storrs Sta. Bul. 192, 1933.

The results of a comparison of a manufactured turkey feed and a ration recommended by the New England Conference Feed Board for growing poults are reported.

*Rape pasture for turkey poults.* O. A. Barton, U. S. Egg and Poultry Mag., 39, 1933, p. 26.

Preliminary work at the North Dakota Experiment Station showed that the average weight of male poults grown to 24 weeks of age on a rape pasture was 15.4 lb., compared with average weights of 15.8, 14.2, 15, and 16.7 lb., respectively, for four lots of male poults on alfalfa range. The average weight of female poults grown on rape was 10.7 lb. at 24 weeks of age, compared with 10.9, 10.9, 10.8, and 10.7 lb. for four lots on alfalfa. The average feed cost per pound of live turkey was 5.1 ct. for the lot grown on rape pasture and 4.4, 5.2, 5, and 5 ct., respectively, for the lots on alfalfa. These results show very favorable results with rape and indicate that it may be used as a substitute or supplement for alfalfa range.

*Influence of sex on utilization of feed in turkeys.* F. D. Brooks, Poultry, Science, 1933, p. 299.

At the Indiana Experiment Station a study covering a period of 3 yr. was undertaken to determine the feed utilizing efficiency of male and female turkeys from 18 to 28 weeks of age.

On the basis of gain in weight the male turkeys used their feed more efficiently during this period than did the female turkeys. Males more than doubled their initial weight, while females gained from 80 to 90 percent of their initial weight. The gain per week averaged approximately 0.75 lb. for males and 0.41 lb. for females. The male birds consumed more feed per bird per week than the females, but showed a range of efficiency from 25 to 50 percent greater than females in the use of feed per pound of gain. The method of computing "feed used per bird" or for each pound of weight could not be used to state accurately the feed actually used by the males or females during this period.

*Egg-Feed Ratio.* C. C. Hampson and Rex E. Willard, Bull. 291, Agric. Exp. St. Pullman, Washington, Jan. 1934.

Price series for eggs and for poultry feed were constructed from 1922 to date. The ratio of egg to feed prices was then computed. This

ratio indicates the relative profitableness of commercial egg production in Washington and is similar to the corn-hog ratio which is widely used throughout the corn belt.

*Investigations with Poultry in Wisconsin.* Wisconsin Sta. Bul. 425, 1933.

The work with poultry includes information entitled Cooking Poultry Ration Destroys Necessary Vitamins, by Hart, Elvehjem, J. A. Keenan, Kline, Halpin, and Holmes (pp. 17, 18); Vitamin G Inadequate in Many Rations for Laying Hens, and Compare Vitamin D Supplements in Laying Ration, both by Halpin, Holmes, and Hart (pp. 18, 19); Soybean Oil Meal Proves Effective as Partial Source of Protein in Poultry Ration (p. 20), Yeast Does Not Improve a Good Chick Ration (pp. 20, 21), Chicks Need Salt but Not Too Much (p. 21), and Feeding Mineral Oil Will Not Change Color of Egg Yolks (p. 22), all by Halpin and Holmes.

*"Scurvy-like" disease in chicks.* W. F. Holst and E. R. Halbrook, Science, 1933, 77, 354.

The condition was observed when chickens were fed a diet of fish meal, yellow maize, yeast, sardine or cod-liver oil and oyster shell. The symptoms were progressive from the third week, and included nervousness, lameness and stiffness of the "hock" joints, followed by haemorrhages from pin feathers, the skin and the intestines, with haematomata under the skin. The most frequent symptom was erosion of the gizzard lining (over 70 % of the cases). Bones were brittle and bone marrow dry and colourless. Haemoglobin was as low as one gram per cent. The fastest growing birds developed the symptoms earliest. Replacing the yeast and part of the fish meal with skim milk powder gave almost normal birds, but 5 g. cabbage per bird was curative. The authors suggest that chickens are either unable to synthesize vitamin C or do so in insufficient amounts. This is a preliminary report, but further evidence would seem indicated.

*Nutritional Myopathy in Ducklings.* A. M. Pappenheimer and M. Goettsch, Journal Experimental Medicine, 1934, p. 35.

Ducklings fed on a diet of skim milk powder, caseins, corn starch, lard, cod liver oil, yeast, salt and paper pulp readily develop a disease characterised by extreme and progressive myasthenia ending in death within a few days. Pathological changes are found in the skeletal muscles. These show wide spread hyaline necrosis of fibers with edema and cellular reaction. The brain and other parts of the central nervous system are not affected, and no significant alterations are found in other viscera or tissues. The creatine content of the muscles is reduced in proportion to the muscle injury. Controls on a natural food diet remain free from the disease. In chickens, on the same diet, the injurious action is limited to the brain. However, in both cases the lesions are associated with characteristic clinical symptoms.

*Influence of coloured Foods. Über den Einfluß der Farbe auf die Nahrungsaufnahme bei Hühnern.* M. Stietz, Berlin, Archiv für Geflügelkunde, Vol. 8, p. 3.

**Summary:**

Hens were feeded to any reception with coloured (red, green, yellow, blue) grains (wheat, rye, oats, barley).

*Influence of foodstuffs upon gastro-intestinal Canal. Der Einfluß verschiedener Ernährung auf die Größenverhältnisse des Magen-Darmkanals beim Geflügel.* Priv.-Doz. Dr. W. Lenkeit, Archiv für Geflügelkunde, Vol. 8, p. 116.

**Summary :**

The influence of soft foodstuffs, some of purely vegetable, others of purely meat composition, mixed normally, has been investigated on 23 Rhode Island Reds in five groups, as to weight, capacity and length of the gastro-intestinal canal. Of the groups of normals and vegetarians, every group also received grit; the other groups, also that of flesh-eating, were kept without grit. These special methods of nourishment were carried out from the incubator until the killing of the birds in the sixth or seventh month. Furthermore, the same dimensions of the gastro-intestinal canal have also been tested on 18 one to two-year old hens (15 Rhode Island Reds, 3 Leghorns).

The gizzard clearly shows the influence of food on its development, and that in adjustment to the various demands on the mechanical capacities of the gizzard according to the foodstuff. With the Normals and Vegetarians, its weight is on the average, 1,7 % up to 2,3 % of the weight of the body, with soft foodstuffs, on the contrary, only 0,9 %.

In opposition to the groups with grit, the small intestine is clearly enlarged as to volume with the vegetarians minus grit, in a smaller measure with the normals minus grit; the increase in weight is slight, and in length merely indicated.

Birds fed animal feed showed, compared with normal, another form os the large intestine and the appendix : namely a tendency to a decrease only in volume.

A utilisable, in any way practical, more considerable increase of the capacity of the intestine to enable the consumption of greater quantities of foodstuffs during the fattening process, cannot be achieved by feeding on foodstuffs of vegetable composition, not even in the rearing of chickens.

*Influence of feeding Yohimvetol. Einfluß von Yohimvetol auf Legebeginn und Legeleistung von Junghennen.* Dr. Weinmiller and Voigt, Archiv für Geflügelkunde, Vol. 8, p. 138.

**Summary :**

A feeding experiment was carried out with 60 young hens, divided into two groups, one of which received an addition of Yohimvetol. With the normal group, laying maturity occurred after 200,6 days, with the Yohimvetol group, after 204,7 days. The laying capacity of the group receiving no Yohimvetol was also slightly better than the Yohimvetol group. The cost of giving Yohimvetol was 28,5 % of the total feeding costs, so that Yohimvetol does not yet come into question as additional food for young hens.

*Better rations, more eggs, greater profits.* W. C. Tully, South Dakota Sta. Circ. 14, 1933, p. 16.

The reasons for feeding poultry, the use and necessity of the various nutrients in feeds, balancing rations, feeding methods and rations, and artificial lights for layers are discussed in this publication.



*The degree of reliability of poultry feeding experiments.*  
F. J. Dudley, Harper Adams Util. Poultry Jour., 18,  
1932-33, pp. 257-261, fig. 1.

In this article from the National Poultry Institute, England, the author discusses the significance of experimental results. It is pointed out that while repetition of experiments in different years and under varying climatic conditions is of value, it is of as great or greater importance to duplicate or replicate the experiment at the same time and place and under similar conditions.

*The nutritional requirements of the chick.* A. G. Hogan and  
R. V. Boucher, Missouri Sta. Res. Bul. 198, 1933, pp. 24,  
figs. 9.

Continuing the study of synthetic diets, it was found that when such diets contained the usual percentage of yeast they were inadequate for chickens. Such diets were not improved by increasing the vitamin A and D allowance, but were improved by increasing the amount of yeast.

Tests of soluble supplements to discover one that contained the factor in which yeast was deficient showed that ether extract of egg yolk and tikitiki offered some promise, and that acid-hydrolyzed yeast was extremely promising. An extract of liver carried the factor, but 10 percent of this extract was required to make the ration adequate. Even when 20 percent of a water extract of yeast replaced the yeast itself, the results were not reliable. The factor in which this water extract was deficient was supplied by a combination of acid-hydrolyzed yeast and ether extract of egg yolk.

A ration was formulated which contained all of the vitamins in soluble form carried by acid-hydrolyzed yeast, ether extract of egg yolk, a liver extract, and tikitiki. Chicks were successfully raised through one generation on this ration, and birds of the second generation had come into production. Each of the vitamin carriers contained an essential factor that was not present in the others in large amounts, but some of the carriers undoubtedly contained more than one factor and further isolation was not possible because all the factors were soluble either in water or ether.

*Effect of dietary and environmental factors on the pH of the intestinal tract.* F. E. Mussehl, M. J. Blish, and  
C. W. Ackerson, Poultry Science, 12, 1933, No. 2, pp. 120-123.

At the Nebraska Experiment Station a study was undertaken to determine the possibilities of using pH values of the contents of the digestive tract of chickens as a measure of the efficacy of certain anti-rachitic agents. The results indicated that the method could not be used to diagnose the presence or absence of rickets or rachitogenic conditions, since the birds apparently could maintain a fairly constant pH in each section of the digestive tract regardless of whether the ration was inherently alkaline or acid. The physiological disturbance in one case where 4 percent of sodium bicarbonate was added to the ration was so great as to produce a pathological abnormality, yet the pH of the digestive tract did not vary appreciably from the controls.

*The influence of certain supplements on the production, hatchability, fertility, and weight of eggs.* R. M. Smith, Arkansas Sta. Bul. 293, 1933.

Continuing these studies, it was found that the egg production of confined pullets was not materially influenced by any of the supplements added to the basal rations. The only supplement that increased production of birds on gravel range and limited green feed or receiving sunlight without range was cod-liver oil or combinations of cod-liver oil, alfalfa leaf meal, and germinated oats.

Germinated oats and alfalfa leaf meal increased the hatchability of eggs of confined pullets, but minerals and cod-liver oil had no such effect. When sunlight was available, only cod-liver oil with alfalfa leaf meal increased hatchability. As the sole supplement alfalfa leaf meal was the most effective in maintaining hatchability. Each of the supplements tested increased fertility of eggs when added to the ration of confined pullets, but for pullets exposed to sunlight the only supplement to have any effect was cod-liver oil and it caused a decline in fertility. Germinated oats feeding resulted in a consistent increase in the average weight of eggs regardless of the method of housing. The combination of cod-liver oil with alfalfa leaf meal as a supplement for pullets receiving sunlight increased egg production and hatchability, but the addition of separate supplements had no effect. It was concluded that the addition of a supplement to the basal rations used in this study was of little benefit when the birds had access to sunlight.

*Alfalfa products as green feed substitutes for layers.* B. W. Heywang, Poultry Science, 12, 1933, No.3, pp. 167-172.

This experiment at the U.S. Poultry Experiment Station, Glendale, Ariz., was undertaken to show the relative value of alfalfa products when used as the principal source of vitamin A in diets for laying birds. The data were obtained from three experiments, each lasting 365 days, in which several different alfalfa products and cod-liver oil served as supplementary sources of vitamin A in rations that were adequate except for this vitamin.

Sun-cured alfalfa meal was found to be a poor substitute for fresh alfalfa, while sun-cured alfalfa leaf meal was more satisfactory than the sun-cured alfalfa meal. Whole alfalfa hays were not reliable substitutes for fresh alfalfa. Fresh alfalfa fed ad libitum and cod-liver oil at the rate of 1.5 percent of the feed intake were superior to all the other supplements used in maintaining life.

*Feeding for efficient growth and prevention of slipped tendons in chickens.* R. M. Sherwood and J. R. Couch, Texas Sta. Bul. 476, 1933, pp. 16.

The data used in this study were obtained from 32 tests, using 20 rations, to ascertain the effect of various carbonaceous and protein feeds on the rate and economy of gains and upon the prevention of slipped tendons. The work was limited largely to six feeds, involving wheat gray shorts, rice bran, and ground oat groats, which replaced part of the yellow corn meal for the basal ration, and meat and bone scrap, cottonseed meal, and whole pressed peanut screenings, which replaced part of the dried buttermilk.

On the basal ration of yellow corn meal, dehydrated alfalfa leaf meal, dried buttermilk, ground oyster shell, bone meal, salt, and fortified cod-liver oil approximately 14 percent of the chicks developed slipped tendons. Replacing 20 percent of the corn meal with wheat gray shorts prevented the development of this condition. This ration also increased the rate economy of gains. Using 5 or 10 percent of rice bran or 10 or 20 percent of ground oat groats to replace a like amount of corn meal decreased the number of slipped tendons and increased the rate and economy of gains. When 6 percent of meat and bone scrap or cottonseed meal replaced a like amount of dried buttermilk, the rate and economy of gains were increased. When the basal ration was modified so that 6 percent of whole pressed peanut screenings, 10 percent of wheat gray shorts, and 5 percent of rice bran replaced like amounts of dried buttermilk and corn meal, the gains were more rapid and economical than with the basal ration.

The following ration fed to chicks in battery brooders produced rapid and economical gains, and few slipped tendons occurred: Yellow corn meal 44.88 percent, dehydrated alfalfa leaf meal 5, dried buttermilk 6, cottonseed meal 6, meat and bone scrap 6, wheat gray shorts 20, rice bran 10, oyster shell 1, salt 1, and fortified cod-liver oil 0.12 percent. The rice bran may be replaced by corn meal, but whole pressed peanut screenings are not recommended for this ration.

*Influence of sex on Utilisation of Feed in Turkeys.* F. D. Brooks, Agricultural Experiment Station, Purdue University, Lafayette, Indiana, Poultry Science, Vol. 12, No. 5.

Male turkeys use feed more efficiently than females when measured by gain in weight from 18 to 28 weeks of age.

Male turkeys more than double their initial weight between 18 and 28 weeks.

Females gain between 80 and 90 per cent. of their initial weight during this period.

Males average approximately .75 pound gain for each week and females .41 pound from 18 to 28 weeks of age. The average and individual gains by males are greater and more certain each week than for females.

Males eat more feed each week per bird than females but less feed in relation to their body weight or gain in weight than females.

Males show a range of efficiency varying from 25 to 50 per cent. greater than the females in their use of feed for each pound of gain between 18 and 28 weeks of age.

The present method of figuring "feed used per bird" or for each pound of weight does not predict what the turkeys of different sexes actually use between 18 and 28 weeks of age.

# PHYSIOLOGY AND ANATOMY

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*The Changes in the Size of some internal Organs in Hens During the Laying Period. Die Größenveränderungen einiger innerer Organe bei Hennen in der Legeperiode. 1. The Pancreas, the liver and the intestals. 2. Heart, Lungs, kidneys, spleen. 1. Der Pancreas, die Leber und die Eingeweide. 2. Herz, Lungen, Nieren, Milz.*  
Dr. J. Podhradsky, Vestník Československa Akademie Zemedelske, 1934, p. 175, 180.

## Conclusions:

1. The weight of the pancreas, liver and the intestine and the length of the intestine and of the blind-gut is subject to alteration according to the season and these changes are very probably connected with the laying period.

2. The pancreas changes in regard of the weight in accordance with the sexual organs. It reaches its largest size during the greatest laying period. The difference between the maximum and the minimum weight is 106.30 %.

3. In the liver the difference is 95.56 %, in the intestine 17.63 %, in the blindgut 25.16 %, in the heart 52.75 %.

The lung is heaviest during the laying pause, during the laying-period the lightest. The difference is 25.89 %. The spleen increases in weight during the laying period, the difference is 24.11 %. In young hens the weight of the kidneys will decrease during the laying period. In older hens the weight increases during the laying-period, the difference is 32.25 %.

*Rests of the Body of Wolff in a Hen.* Gottardi, La Clinica Veterinaria, 1933, Jan.

In the vicinity of the left-hand testicle, a tumour of 8 cm length by 5 cm breadth was found. Histo-pathological examination proved that it was a rest of the "body of Wolff".

*A sex difference in pituitary size and intestinal length in doves and pigeons.* O. Riddle and T. C. Nussmann, Anat. Rec., 57, 1933, No. 2, pp. 197-204. (Ref. Exp. St. Record, Vol. 71, 1934, p. 34.)

Data are reported on intestinal length, body weight, and whole and anterior pituitary weights, together with ratios between them of 305

healthy ring doves and 227 common pigeons, according to sex and race. The females were found to have relatively larger whole pituitaries and anterior lobes and longer intestinal tracts than males. Some suggestion was given that races with larger and smaller pituitaries and longer and shorter intestines have been established in the colony of pigeons at the Carnegie Institution.

*Phosphorus in the Comb of the Cock. Le Phosphore dans la Crête du Coq.* M. Berdnikoff, Comptes rendus de la Société de Biologie, Vol. 65, 1934, p. 1189.

The comb of the cocks contains anorganic phosphor, which can be dissolved in acetic acid and organic phosphor. Several analyses of comb-tissue are reported.

*Chemical differences between the Combs of Cockerels and Capons. Essais de comparaison chimique entre les Crêtes de Coq et de Chapons.* A. Berdnikoff and Ch. Champy, Comptes rendus de la Société de Biologie, Vol. 117, 1934, p. 515.

Owing to castration, the muco-elastic tissue in the comb of the cock will disappear. The chemical differences between the combs of cockerels and capons are given. The difference in glyco-proteids and phosphoproteids is very great.

*The wattles in the embryo and the chick of Leghorns and Orpingtons. Les Barbillons du Coq domestique chez l'Embryon et le Poussain de Races Leghorn et Orpington.* R. Louvier, Comptes rendus de la Société de Biologie, Vol. 117, 1934, p. 397.

Description of the construction of the wattles of the embryo and chicks. The authors do not agree with K. Wodzicki, who reports that the comb is the only appendix of the cock which develops itself during the embryonic life.

*Results of Thyroidectomy in Cockerels and Drakes. Sur le conditionnement hormonal du développement testiculaire chez les oiseaux. Résultats de la Thyroidectomie chez le coq et le Canard.* J. Benoit and M. Aron, Comptes rendus de la Société de Biologie, Vol. 117, 1934, p. 221.

The removal of the thyroid glands of cocks and drakes arrests the development of the testicles. The thyroid secretion has stimulating influence on the spermatogenesis of the birds.

*Injection of the Prehypophyseal gland in ducks. Sur le Conditionnement hormonal du développement testiculaire chez les oiseaux. Injections d'Extrait préhypophysaire chez le canard. Remarques sur divers éléments d'Interpretation des Expériences. Influence de l'Age.*

J. Benoit and M. Aron, *Comptes rendus de la Société de Biologie*, Vol. 117, 1934, p. 215.

The testicle of ducks appeared to be little sensitive for prehypophysis extract in young animals, very sensitive in animals of moderate life and of middling sensitiveness in adult birds.

*Role of the Thyroidgland on the development of tests. Sur le conditionnement hormonique du développement testiculaire chez les oiseaux.—Rôle de la Thyroïde.* M. Aron and J. Benoit, *Comptes rendus de la Société de Biologie*, Vol. 117, 1934, p. 218.

Under the influence of thyroid extract, the volume of the testicles of ducks, which are in the sexual period of rest, will increase considerably.

*Broodiness and Ovary-hormones. Brütigkeit und Ovarhormon.* Prof. Dr. P. Hertwig and Dr. Eugen Schwarz, *Archiv für Geflügelkunde*, Vol. 8, p. 75.

**Summary:**

The broodiness of hens did not be interrupted by the injection of "Menformon", which was given three times for five days, altogether 500 units of mice. The authors conclude, that the hormones of ovary (follicle hormones) is not responsible for the beginning or the end of broodiness, and that the hormones of the anterior lobe of the pituitary gland for maturing of follicle are influencing the end of broodiness.

*Influence of female Hormone in Cockerels. Über den Einfluß des weiblichen Sexualhormons auf die Entwicklung junger Haushähne.* Prof. Dr. T. Vacek, *Archiv für Geflügelkunde*, Vol. 8, p. 80.

**Summary:**

The female hormone, i. e. an ovarian extract and a pure hormone Folliculin, was injected in young cocks aged 6-8 weeks. Different doses of this hormone — 10-400 m. u every second day for a period lasting from 30 to 50 weeks — were used. The growth of the cocks, whatever doses they received, was diminished. The testes of the cocks which received injections of small amounts of the female hormone showed an increased development, and were larger than those of the control fowls. On the other hand the cocks receiving large doses of the female hormone had testes small and not developed.

*Epiphysis, Sexual Glands and Sexual Uniformism with Guinea fowl. Epiphyse, Geschlechtsdrüsen und Geschlechtsuniformismus bei den Perlhühnern.* Dr. J. Krizenecky, *Vestník Československé Akademie Zemedelske*, 1932, p. 764.

Discussion with Zahalka, who asserts that the sexual uniformism in the Guinea fowl could be interpreted by the hyperfunction of the pineal glands. Krizenecky points out, that by hyperpinealisms a hypofunction of the sexual glands would have to be expected.—This hypofunction however leads to a feathering of the male type, whilst in Guinea fowl a feathering of the female type is present.

*Changes of the incretoric Glands and internal Organs in Poultry During the laying period. Die Veränderungen der inkretorischen Drüse und einiger innerer Organe beim Geflügel im Produktionszyklus.* Dr. J. Podhradsky, Vestník Československé Akademie Zemedelske, 1934, p. 273.

Besides the ovary and oviduct, the weight of the Thymous gland undergoes also an important change; Parathyroid gland, pararenal glands are becoming larger with age, lungs, ovary and oviduct remain unaltered. Hypophysis, Thymus, pancreas, spleen liver, heart, kidneys and intestines get smaller.

The laying of eggs progresses parallel with the changes in the incretoric glands or preceeds it.

Two groups of glands and organs can be distinguished: the first (hypophysis, thyroid and lungs) are largest before the laying period begins, the second group is largest during the laying period.

The reason of these changes lies in the sexual cyclus and is under the influence of the respective season (temperature, light, etc.).

*Rooster without Wings.* Journal of the Am. Vet. Med. Ass., Vol. 84, 1934, p. 809.

A rooster, born without wings and now grown to adulthood, is the gift of Mrs. Olia Deering, of Rose Hill, Ky., to the Smithsonian Institution. It has been given quarters at the National Zoölogical Park where it is being studied by Dr. Herbert Friedmann, curator of birds at the U. S. National Museum, according to Science. Fowls without wings are hatched occasionally, but all hitherto reported have died while still young chicks. The present specimen, a Plymouth Rock, is a healthy bird. Its parents were normal.

*Basal Metabolism in Hens. Le Métabolisme basal chez différentes races de Poules.* G. Iftimesco, G. Nichita, J. Popesco and N. Tuschak, Comptes rendus de la Société de Biologie, Vol. 113, 1934, p. 492.

The basal metabolism has been ascertained with different races at 20 and 22° C. The basal metabolism follows the law of the body weight as well as the body surface.

The production of warmth however is reversed proportional to the weight. The number of calories per square meter surface and per 24 hours will be for Leghorns 1 and for the other races about 1.

*Quantitative Tests of digestion on the Domestic chicken. Quantitative Verdauungsversuche am Haushuhn.* H. Engler, Biedermanns Zbl., Vol. 5, p. 329, 1933.

In the present treatise the methods to execute digestion tests with the chicken are specially submitted to a close criticism. The comparison of the manner of executing the tests, by which the excrements of normal animals are divided in to faeces and urine, by chemical means with that of the immediately divided acquisition of faeces and urine after creating an artificial after by operatic methos, proves the suitability of both methods. The author prefers however, also from considerations of a

feeling for the animals, the chemical separation, which, by a further extension of the methods for the immediate definition of the nitrogen in the excrements, can yet be further simplified. In several digestion tests with cocks the following average digestion coefficients were found:

	Organ. substance	Crude Protein	Crude fat	Crude fibre	N-free extracts
Platamais . . . . .	85,9	73,6	92,3	33,1	89,4
Fishmeal . . . . .	85,8	91,2	84,6	—	—
Linseed cake . . . .	64,2	78,5	74,8	1,0	70,7
Maizena food . . . .	60,2	71,2	84,2	20,7	59,0

In comparison with other domestic animals, the chicken digests the organic substance, the crude protein and the N-free extract stuffs of the approved foodstuffs somewhat difficult, the crude fibre considerably worse. The digestion of the crude fat is exceptionally good with the chicken, partly even better than with other kinds of animals.

*Resorption in the Crop. Zur Frage des Resorptionsvermögens des Kropfes.* A. Trautmann and J. Schmitt, Tierärztliche Hochschule Hannover, Deutsche Tierärztliche Wochenschrift, Vol. 42, 1934, p. 228.

Several investigators have, by their tests, diagnosed, that no resorption takes place in the crop. The author has, by means of arecolin injections, caused a strong secretion of the saliva in the cavity of the mouth in chickens, ducks and pigeons. After this the crop in test animals was underbund in the chest cavity and arecoline was introduced into the crop. After 4 to 5 minutes appeared already a strong salivation and a quantity of saliva was obtained, which was 100 times greater than that normally secreted in two hours. From this can be seen, that resorption takes place in the crop. In pigeons, the test progressed with similar results. In the duck, poisoning symptoms appeared with 5 m. gr. whilst in the chicken such symptoms were noticed only after 20 m. gr.

*Basal Metabolism in Bantams. Sur l'Intensité des Echanges respiratoires des Poules et des Coqs de Race naine.* G. Nichita and G. Iftimesco, Comptes rendus de la Société de Biologie, Vol. 115, 1934, p. 661.

From the researches it appeared that the cocks of Bantams have a higher metabolisme than the hens, contrary to the tests undertaken by Benedict Landauer and Fox with Rhode Islands.

*Respiratory Changes in a state of starvation. Sur les Echanges respiratoires de quelques Races de Poules dans l'Inanition.* G. Nichita and J. Mirced, Comptes rendus de la Société de Biologie, Vol. 115, 1934, p. 664.

The respiratory quotient of the basal metabolism, during a state of starvation does not differ much from that during the night.

*Respiratory Changes in Pigeons. Sur l'Intensité des Echanges respiratoires chez les Poules en Inanition.*



G. Nichita and G. Iftimesco, *Comptes rendus de la Société de Biologie*, Vol. 115, 1934, p. 667.

During the whole period of starvation the metabolism gets continually smaller.

*Some effects of fasting on the composition of the blood and respiratory exchange in fowls.* K.M. Henry, H.E. Magee and E. Reid, *J. Exp. Biol.*, 1934, 11, 58-72.

A peak in the "true" blood sugar curve of fasting fowls occurred on the 3rd or 4th day, and was not related to the concentration of uric acid or N.P.N.; cholesterol or lecithin in the blood, nor the muscle glycogen: the relation with liver glycogen and the R. Q. was inconclusive. After ingestion of glucose, the hyperglycaemic response and the rate of oxidation of sugar decreased as the length of the previous fast increased. The hyperglycaemia produced by adrenalin was greater for fasts of 96 hours than for shorter periods.

During fasting the R. Q. fell rapidly from 1.0 to 0.70 and remained fairly steady for 7 days, during which time protein feeding caused little change, but fat ingestion caused an elevation of the R. Q. Of the urinary N, uric acid formed 50 % or more during fasting, and 30 % or more after a protein meal. During fasting, the metabolic rate was higher in the morning than in the evening.

*The feather of the guinea fowl and a mathematical theory of individual feather patterns.* M. Hardesty, *Jour. Expt. Zool.*, 66, 1933, No. 1, pp. 53-87.

A detailed study of feather pattern formation in the guinea fowl is reported, which indicates that the pattern is essentially predetermined in the feather follicle, although thyroxin injections may modify it. The rates of barb formation and pigmentation reactions were calculated.

*Some chemical Factors governing Egg Formation in the Hen.* G.D. Buckner, Ph.D. J. Holmes Martin and W.M. Insko, *Agric. Exp. Station, Lexington, Kentucky, The South African Poultry Magazine*, Aug., 1931.

In non-laying hens the blood obtained from the anterior mesenteric vein coming from the intestine contains the same amount of calcium, in laying hens the blood from the vein contained 12 per cent more calcium than that obtained from the artery. In the non-laying hens the pH value of the mucosae of the uterus, isthmus and albumen-secreting section ranged from 6.2 to 6.5, while in the laying hens these figures in the albumen-secreting section ranged between 6.3 and 6.6 and that of the mucosae of the isthmus and uterus between 5.6 and 5.9.

The egg albumin as secreted from the folds of the mucosa of the albumen-secreting section has a pH value of 6.7 or 6.8, while that obtained from the mucosa of the uterus has pH values varying from 7.3 to 7.5.

At present the experiments are directed towards the precipitation of the calcium carbonate of the egg shell and authors have reason to believe that it is the result of the action of an enzyme or hormone.

*Blood analyses of normal Bronze turkeys.* H. M. Scott, P. J. Serfontein, and D. H. Sieling, Poultry Science, 12, 1933, No. 1, pp. 17-19.

The blood of 10 Bronze pullets and 5 young Bronze toms was analyzed at the Kansas Experiment Station. The detailed results are given in tabular form.

The variations between individuals within a sex were slight. The mean figures were approximately the same for both sexes, with the exception of uric acid and hemoglobin which were higher in the blood of the male turkey. While the analyses were similar for normal turkey blood and normal chicken blood, the following exceptions were noted: The marked difference in uric acid content between sexes was not apparent in chickens, the urea nitrogen content of chicken blood was somewhat lower than that of turkey blood, and the difference in hemoglobin content of the blood of the sexes was very marked in the case of chickens.

*The Research of aerobic Microbes in the intestinal contents of Healthy turkeys. La recherche des microbes aérobies dans le contenu intestinal des dindons saines.* J. Kucel, Veterinarski Archiv, 1934, p. 341.

The research of aerobic microbes in the contents of the intestines of 25 healthy turkeys, gave the following results:

1. In the intestines of the healthy turkeys one finds quite constantly: *Bact. coli*, *Escherichia acidilactici*, *Streptococcus faecalis*.

2. In all parts of the intestines is found *Bacterium coli*; *Escherichia acidilactici* prevail with preference in the anterior parts whilst the *Streptococcus faecalis* is ordinarily encountered in the posterior regions of the intestines.

3. The number of the aerobic micro-organismus grows the more one gets away from the duodenum and attains its height at the rectum. The duodenum is found in 25 % and the ileum in 4 % of the steril cases, as regards the microbes in question.

*Drawing blood by punctuation of the Heart. Über die Technik der Entnahme größerer Blutmengen von lebenden Vögeln mittels der Herzpunktion.* W. Glaenz, Zentralblatt für Bakteriologie, Originale, Vol. 150, 1933, p. 462.

Description of a method to obtain sterile blood by means of the heart punctuation and which differs from the method described by Margaret Lewis.

*Double formation of Ovary and Oviduct. Doppelbildungen des Eierstocks und des Eileiters beim Haushuhn.* Prof. Dr. A. Eber, Institutsdirektor, Archiv für Geflügelkunde, Vol. 7, p. 379.

#### Summary:

At 7500 full grown laying hens could be seen only once a second right ovary beside an undeveloped on the left. On the other hand in six cases a full developed and working right oviduct was found beside an also functioning left, in nine cases an undeveloped right oviduct and

in twenty-two-cases at the place of the right oviduct were found cysts of the size of a pigeon's egg up to a small children's fist as faulty developments.

Fourteen different cases of double formation of the oviduct are discribed.

*A biometric study of molt in White Leghorn hens.* W. A. Hendricks, Poultry Science, 1933, p. 287.

The results reported in this paper are based upon several years' investigation on the effect of feeding inorganic sulfur compounds to laying hens at the U.S.D.A. Animal Husbandry Experiment Farm, Beltsville, Md. The data were analyzed for the effect of these compounds upon the molt of White Leghorn hens and upon their egg production.

The feeding of certain inorganic sulfur compounds to laying hens had no consistent effect on the length of the molting period. Late-molting birds had a shorter period than early-molting birds. Slow-molting birds had a higher rate of egg production during the molting period than more rapid-molting birds. During the period when new tail and wing feathers were developing, egg production was retarded more than during the rest of the period. The time required to start molting and the length of the molting period apparently had no effect on the total number of eggs produced during the experimental period of approximately two years, or during the first laying year. In this work the time required to start molting was considered as the number of weeks between the time observations were begun and the appearance of pinfeathers on the neck and breast of the bird.

*The hemoglobin content of chicken blood.* A. D. Holmes, M. G. Pigott, and P. A. Campbell, Jour. Biol. Chem., 103, 1933, p. 657.

Following their usual experimental procedure, the authors made a study of the hemoglobin content of the blood of normal chicks raised on high quality commercial chick-growing mash. Blood samples from the wings were taken when typical chicks were 3, 6, 9, and 12 weeks of age.

Cockerels showed a consistent increase in hemoglobin of from 9.6 g per 100 cc of blood at 3 weeks to 10.1 g at 12 weeks. During the same interval pullets increased from 9.3 to 9.7 g. Limiting the water consumption during crate feeding did not increase the hemoglobin values. Based on these results it was concluded that rapidly growing chicks fed well balanced high quality commercial rations had a hemoglobin content of about 9 to 10 g per 100 cc of blood.

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# EGGS AND TABLE POULTRY

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## YOLKS

*Permeability of Yolk membrane. Sulla Permeabilità della Membrana vitellina dell'uovo di Gallina.* A. Orri, Bolletino Società Italiana Biologia sperimentale, Vol. 8, 1933, p. 668.

The yolk was placed for two hours in a glyucose-solution. Before the test no glyucose was noticed in the yolk, whilst after test the presence of glyucose was established. Also saccharose penetrated into the yolk membrane, as well as raffinose.

*The Colour of the Yolk. Alles was wir über die Dotterfarbe wissen.* Dr. B. Grzimek, Geflügel-Börse, 6. Jan. 1933.

1. The colour of the yolk does not originate from the body of the hen, but is influenced by the food.

2. There exists single hens as well as whole breeds with hereditary pale yolk-colour, which can hardly be influenced by the food.

3. In the greatest part of these cases, the light colour of the yolk is caused by a great laying capacity, by a simultaneous absence of colour containing food stuffs.

4. Yolk colouring food-stuffs are: yellow mais, green food, green-food silage (10-25 grams), red carrots (up to 50 gr.), beet-roots (15-20 gr.), Soja-meal (8-10 %), well browned slices of sugar beets (2 %).

5. All these food-stuffs will only be of influence if given in as large as possible quantities.

6. Sprouted grain, beets, buckwheat, white mais and rice have no yolk colouring propensities. Rice, when given in great quantities, can neutralize the effect of other yolk colouring matters.

7. Besides paprika and pimienta there are no other cheap chemical means known to influence the colouring of the yolk.

*Golden-Yolked Eggs and yellow legged Chickens. Pimiento Pepper Experiments in Georgia.* U. S. Egg and Poultry Magazine, March, 1931, Georgia Exp. Station Bulletin No. 160.

### Conclusions:

1. Eggs from hens receiving ground, dried ripe pimienta in the ration had a higher per cent of hatchability than those from hens fed control, or plain, ration.

2. Chicks hatched from eggs of pimienta fed hens averaged stronger than those from eggs of plain fed hens.



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3. Pigment appeared in the shanks of chicks hatched from pimiento eggs in 5 to 6 days after hatching, after yolk had been more completely absorbed.

4. Chicks from pimiento eggs averaged more pigment in the shanks at the end of the experiment than those from the plain eggs in the same lot.

5. With one exception the cockerels averaged more pigment in the shanks than the pullets.

6. At least as good gains can be expected from rations containing pimiento as from plain rations.

7. Pimiento in the ration gives a rich yellow color to the shanks, skin, fat, etc., the amount of color depending on the amount of pimiento fed.

8. Pimiento imparts no pepper flavor to the chicken meat.

9. Chickens make use of another carotinoid besides xanthophyll, that one being capsanthin.

*Do you know what Feeds Affect Yolk Color?* Hermann W. Paulus, Cornell University, New England Poultryman, October 15, 1932.

Yellow colored yolks are caused by feeding large quantities of yellow corn and green leafy parts of plants. Such feeds as wheat, oats, buckwheat, white corn and beets produce light colored yolks. Pimiento peppers when fed in large quantities produce a red colored yolk. Rations rich in cottonseed meal produce yolks which turn an olive green when held in storage. Shepherd's purse and Penny Cress, two spring weeds, produce olive drab or 'grassy' yolks. No difference in flavor or food value is noticed in the above cases. However, rape, turnips, fresh fish, onions and sometimes cabbage, will affect flavor when fed in large quantities.

According to H. L. Kempster, of the Missouri Agri. College, the degree of yellow color in the yolks, under normal conditions, is a fair indication to the Vitamin A content of the eggs. He also points out that pale yolked eggs rich in Vitamin A can be produced when the vitamin source is not connected with yellow pigment.

*The Relation of Egg Yolk Color to some nutritive Properties of Eggs.* N. R. Ellis, Bureau of animal Industry, U. S. Dep. of Agriculture, U. S. Egg and Poultry Magazine, Oct. 1933.

Foods having a yellow color are good sources of Vitamin A, necessary for growth and health. The color of egg yolk is different from that of the natural color of butter. Vitamin A is formed from the yellow pigment of butter (carotene) while it cannot be formed from that of eggs (xanthophyll). Yellowness in eggs, however, indicates the presence of Vitamin A because it shows that the hen has eaten plant foods rich in carotene and has transferred colorless Vitamin A to the yolk. A light colored yolk may also be rich in Vitamin A if the hen has received foods containing it; such as cod-liver or other oils that are good sources of Vitamin A. Eggs are an important source of Vitamin A.

*The Relation of Egg Yolk Color to some nutritive Properties of Eggs.* N. R. Ellis. Bureau of Animal Industry, U. S.

Dep. of Agriculture, Philippine Poultry Journal, Dec. 1933.

There are two classes of carotenoid pigments, the carotenes and the xanthophylls. Most of the color in egg yolks is due to xanthophyll pigments. Chickens suffering from a lack of vitamin A are promptly restored to normal health when carotene is added to the diet. Yellow corn, green alfalfa leaf meal, and green grass are all highly important sources of vitamin A and at the same time supply abundant amounts of xanthophyll for the pigmentation of the egg yolk. At the U.S. Animal Husbandry Experiment Farm, Beltsville, Md. hens on a diet nearly devoid of yellow pigments but with a cod liver oil supplement produced nearly colorless eggs which were equal for or possibly richer in Vitamin A content than highly pigmented eggs produced on a normal diet.

*The Effect of Rations on the Colour of Egg Yolk.* E. W. Henderson and H. L. Wilcke, Iowa State College, Ames. Poultry Science, Vol. 9, p. 357.

This study was made to determine the time required for the feed to exert an influence on the colour of the egg yolk and to determine whether the colour of the body fat of the hen might exert an indirect influence.

A number of hens, most of which were not in egg production, were fed a dye (Sudan III.) in their mash until the body fat was definitely stained, after which the dye was discontinued. When the hens came into egg production the egg yolks were studied with a colour analyser for evidences of the presence of the Sudan III. dye. Dye appeared on the outer surface of the egg yolks as early as three days after it was fed to the hens. Traces of dye appeared in egg yolks for as long as 16 days after the dye was discontinued in the feed of the hen.

The results indicated that the colour of the egg yolk was influenced by the ration only and not by the colour of the body fat of the hens. Egg yolks free from Sudan III. dye were produced after the dye feeding was discontinued while the dye still remained visible in the body fat of the hens which produced the eggs.

*The Influence of the Ration upon Yolk Color and Vitamin A Content of the Egg Yolk.* H. L. Wilcke, E. V. Nelson and E. W. Henderson. U. S. Egg and Poultry Magazine, May 1934.

Data have been presented which support the work of others showing that the vitamin A content of the egg yolk is influenced quite markedly by the amount of this vitamin in the diet. It had previously been demonstrated experimentally that pale yolked eggs might contain fully as much vitamin A as those of a deeper color, but these eggs were not produced under practical conditions. It has been shown in this work that hens having access to green grass and receiving yellow corn in the ration produced eggs containing more vitamin A than those from hens receiving 2 per cent of a good grade of cod liver oil. Since eggs are recognized as a good source of vitamin A, it would seem desirable that the highest standard of potency be maintained. Cod liver oil is not usually fed in such great quantities as 2 per cent in general poultry husbandry practice, and it would seem desirable, therefore, to supplement the ration with other sources of vitamin A in addition to cod liver oil.

*Egg Yolk Color as Affected by Certain Xanthophyll Bearing Feeds.* L. F. Payne and L. A. Wilhelm, Kansas State College, U. S. Egg and Poultry Magazine, 1933, p. 47.

The effect of certain common xanthophyll bearing poultry feeds on yolk color was studied with individual hens, farm flocks and commercial flocks. The feeds tested were yellow corn, white corn, yellow milo, wheat, oats, kafir, meat and bone scraps; three grades of alfalfa hay; and wheat, rye and alfalfa pasture. Egg yolks from hens fed definite percentages of each of the above in rations otherwise free from xanthophyll were compared with those from hens fed a basal xanthophyll free ration. The Munsell formula, using the hue, brilliance and chroma, was employed in making the comparisons.

Biological tests showed only small amounts of xanthophyll in yellow milo, wheat, kafir, oats, and meat and bone scraps. Semi-bleached and fully-bleached alfalfa leaves and hay produced yolks almost as dark as bright green alfalfa leaf meal and hay when fed at the same level. A ration consisting of 70 per cent yellow corn increased the yolk color 2.36 units less than the expected amount when calculated from results obtained with a ration composed of 35 per cent yellow corn. One-half ounce of green rey fed daily to individual hens on a colorless basal diet gave more color to the yolk than did an equivalent amount of either green wheat or alfalfa.

All hens were apparently able to utilize about the same amount of xanthophyll when the feed intake mixture was the same. The hens did, however, show a wide variation in choice exercised when given an opportunity at free choice feeding, in which case there occurred a wide variability in yolk color. While confinement of the flock gave the most uniform yolk color, it was possible, by limiting and timing the hours spent on the range and regulating the ingredients in the ration, to partially control yolk color in the farm flock. A balanced ration practically devoid of coloring matter supplied birds on green range resulted in very few excessively dark yolks.

The most uniform yolk color was obtained from confined flocks fed all-mash or mash supplemented with xanthophyll free scratch grain.

*Yolk Color Preference.* Poultry Item, October 1933.

A survey conducted by Berley Winton of the University of Missouri in New York City recently has substantiated many "suspicions" on the part of producers that the yolk color preference, so-called, of New York consumers is a dealer preference and a myth as far as the actual consumer is concerned.

10,358 consumers were asked what they preferred in the way of yolk and shell color in various stores in New York City. For demonstration purposes, uniform shades of yolk color were obtained by using eggs produced under controlled feeding conditions, similar to those recommended in articles in this publication recently. Slightly more than 33 % of the consumers wanted their yolks light; 25 % preferred dark yolks and 20 % yolks of medium color. The remaining 20 to 22 % had no preference. In other words, 45 % approximately, preferred dark or medium colored yolks against 33 % light yolks, and 65 % preferred shades darker than the usual strawcolored, including those without any preference.



*Consumer Preference for Shell and Yolk Color in the Chicago Territory.* F. E. Eliot and L. E. Card. U. S. Eggs and Poultry Magazine, August 1931.

In an attempt to find out what consumers think about egg Shell color, a study was made in the city of Chicago and in adjacent suburban towns during January and February, 1931.

Summary of all answers: Total 11,443 answers.

Shell color desired	%	Yolk color desired	%
No preference . . . .	27.7	No preference . . . .	21.7
Brown shell . . . .	29.3	Pale Yolk . . . .	32.8
White shell . . . .	43.0	Orange Yolk . . . .	30.9
		Medium Yolk . . . .	14.6

*Determination of the Colour of the Yolk. Die Veränderung und Wertbestimmung der Eidotterfarbe.* Dr. W. Kupsch, Berlin, Archiv für Geflügelkunde, Vol. 8, p. 113.

**Summary :**

The yellow pigments of egg yolks are carotinoids, generally called xanthophyll. The yolk color is dependent of the amount of xanthophyll in the feed. The pigments of the body fat have little or no influence on yolk color.

The feed stuffs which darken the yolk-color, are the fresh green feeds which contain chlorophyll. Their influence is dependent of the amount fed to the birds. Dried green stuffs and silofeed gave in most cases good yolk-color.

The dark colored (red and yellow) carrots may show an influence on yolk color. The different kinds of beets gave practically no results with respect to yolk color. Dried sugar beets showed very different results.

Yellow corn and its refuses gave good yolk color.

Pimento pepper and Mate, dried plants products, have shown good results with respect to yolk color also. The flower leaves of Physalis and Tagetes gave good results.

Chemical additions to the hen feed as Sudan III, the "Azo" colors and other yellow or red food colors have no practical feeding value.

The results of many of the experiments are often different. Therefore it is necessary to arrange basal experiments. A color scale with numbers from 1 to 10 made of a normal set of colors after the color-atlas of Ostwald is a good help especially for the experimental work. It is now sufficient to write in the report only the number of the scale that nearly equals the yolk color.

*Colour in Yolks. Über den Farbstoffgehalt der Hühnereier.* Doz. Dr. T. Radeff, Archiv für Geflügelkunde, Vol. 8, p. 51.

**Summary :**

In the preceding work I have examined the colourstuff content of hen eggs and have found that the yolk of the Bulgarian market eggs contents in the medium 2.25 mg Carotinoids. The yolkmass contents 13.41 mg % colourstuff. The proof of the amount was made colorimetrically with the help of the colorimeter of Autenrieth and Königsberger. As a testsolution served Kaliumbichromat.

*The Effect of Feeds on the Quality of Eggs.* Sherwood, 43rd Annual Report, College Station, Brazos County, Texas 1930.

In the study of sources of protein for laying hens, it has been found that cottonseed meal can be used in the ration as a substitute for meat scraps. Subsequent developments, however, have shown that a storage problem is involved in eggs produced from hens fed on cottonseed meal and perhaps several other feeds. Hence, it becomes important to determine the extent to which these feeds may be used in the production of eggs without impairing their storage quality. The plan of this work has been to determine the storage quality of eggs produced by feeding laying hens on certain rations, including meat scraps, water extract of cottonseed meal, ether extract of cottonseed meal, benzol extract of cottonseed meal, residue of cottonseed meal after these extracts were made, refined cottonseed oil (Wesson oil), raw linseed oil, cod liver oil, cottonseed meal, and soybean meal. These feeds were fed to hens in gelatin capsules twice daily so that definite records are available as to the feeds consumed by all experimental hens individually. The process is one of endeavoring to determine the causative agent with the hope of being able to eliminate it from vegetable protein rations in the production of eggs of high keeping quality.

The color of the yolks of the eggs varied greatly. Some were mottled yellow; others were salmon color; while others were a green, or almost black. The white varied in color from normal to pink. During the time the eggs were being held in storage some of the yolks absorbed part of the white.

The results of this study thus far indicate that the injurious material of cottonseed meal is possibly associated with the oil. The data secured were insufficient to determine positively whether linseed oil and cod liver oil affect the storage quality of eggs. Further study is being made on this project.

*Those Eggs with olive Yolks. The common cause and its Remedy. Dangerous Seeds from Shade Trees.* N. D. Kay, Poultry, Jan. 14, 1933.

Seeds and berries rich in tannic acid are most prone to cause this discoloration. Large quantities of rape produce also egg-yolks ranging in color from pale olive to dull black. Rape yields more sulphur than lucerne, hence the deleterious effect on egg-yolk color.

*Iodine Content of Hens Eggs as affected by the Ration.* Dr. Bethke, Wooster, Ohio, The Journal of Nutrition, July 1933 (Ref. U. S. Egg and Poultry Magazine, Dec. 1933).

**Conclusions:**

1. The iodine content of hens' eggs varies directly with the amount of this element in the ration of the bird.
2. The feeding of 2 to 5 milligrams of iodine daily per bird, in the form of dried kelp, iodized linseed meal, or potassium iodide, increased the iodine content of eggs approximately 75 to 150 times, respectively.
3. The percentage of iodine in eggs immediately decreases upon the discontinuance of iodine feeding.
4. The amount of iodine in eggs is independent of the form in which it is fed to the birds.

*Iodine in Eggs.* C. W. Sievert, U. S. Egg and Poultry Magazine, Dec. 1933.

Experimental work seems to show definitely that it is impossible to put iron or copper into eggs by feeding rations with additions of these elements to the hen.

Dr. H. J. Almquist of the University of California published an interesting article on this subject in "Nulaid Eggs" in March 1933. He shows that the iodine content of eggs can be increased many times by feeding iodine-containing material. He has used potassium iodide, kelp meal, dessicated thyroid gland, fish meal and oyster shell, all of which contain iodine in some form. The first mentioned materials contain much larger amounts than the last ones. He shows that it is possible to put considerable amounts of iodine into eggs by feeding iodine compounds in the feed.

*Vitamin D. Content of Egg Yolk.* H. D. Branion, Ontario Agric. College, Guelph, T. G. H. Drake and F. F. Tisdall, University of Toronto, U. S. Egg and Poultry Magazine, July 1934.

Description of history about experiments on Vitamin D in egg yolk. Egg yolk from pullets receiving 2 per cent of cod liver oil had a vitamin D coefficient of 0.7 but the substitution of 10,000 X activated ergosterol only resulted in an increase of 185 times in the vitamin D value of yolk oil tested on rats. Ultra-violet irradiation of the hen increased the vitamin D content of the egg yolk. Experiments again confirmed the relative inefficiency of irradiated ergosterol, compared to cod liver oil as an antirachitic agent for chicks. Apparently the physiological process involved in the metabolism of irradiated ergosterol and its subsequent transfer to eggs does not increase its ability to prevent rickets in chicks.

*Vitamin D content of Egg Yolk. II. The Influence of various Sources of Vitamin D on the antirachitic Value of Egg Yolk.* H. D. Branion, T. G. H. Drake and F. F. Tisdall, The U. S. Egg and Poultry Magazine, August 1934.

It is evident from these results that exposure of hens to sunshine or ultra-violet rays from a mercury vapour lamp under the conditions of the investigation had little effect in increasing the vitamin D content of the egg yolk in contrast to the results obtained by the addition of cod liver oil to the diet.

The addition of cod liver oil at a one percent level to the hens' ration increased the yolk potency more than six times in vitamin D, the substitution of an equal amount of 100 X viosterol increased the potency only thirty-five fold over the cod liver oil group, again showing an inefficiency in transfer.

*Significance of the Changes in Density of Yolks and Whites of Eggs with Changes in Temperature in preventing stuck Yolks.* R. F. Sharp and Ch. K. Powell, Cornell University, Ithaca, N. Y. The U. S. Egg and Poultry Magazine, December 1929.

The effect of temperature on the change in density of the white and yolk were investigated. The density of the yolk changes much more

with temperature than does the white. On the whole, the density of the white and the yolk of the fresh egg approached the same value at near 32° F. About one-third to one-half of the yolks from fresh eggs would sink at 36° F. The yolk increases in density 0.0120 units on coloring from 77° to 32° F., while the white increases 0.0043 units, or about one-third as much. The tendency of the yolk to rise at 77° F. is 16 times greater than its tendency to sink at 32° F. This is a considerable difference in force and should be considered as an important factor in the formation of stuck yolks.

*Medicated Eggs. Sulle Uova Medicamentosi.* Dr. A. Scacini Rivista di Avicoltura, 1934, p. 110.

Literary oversight of the history regarding the introduction of medicaments into eggs.

The last returns are from Ambrosio, who, in eggs which were produced at Milan, found 250,000 gammas of iodine. The iodine can be found in such like eggs, having a high percentage of iodine, in the yolk and in the albumen. In eggs with a lower percentage of iodine it is found only in the yolk.

*Medicated Eggs.* Canada Poultryman, March 1931.

Dietotherapy introduces a new feature into the business of egg production in the form of medicated eggs. The popularity of the egg as an article of diet has grown phenomenally since the introduction of grading a little more than 10 years ago. This increased popularity has brought about a substantial expansion in egg production which has meant that more attention has been paid to scientific feeding. The latest development established through a combination of medical, chemical and metallurgical research that the mineral content of eggs can be substantially increased by the introduction of finely powdered minerals mixed with milk or milk paste fed to hens. Producing medicated eggs to conform to specific standards will likely prove a most important and profitable development in the poultry industry in the near future. — Dominion Department of Agriculture.

*Germs in Iodine Eggs. Sull'azione delle Uova iodate su alcuni Microorganismi patogeni.* Dr. G. C. Sparapani, Giornale degli Allevatori, 1934, p. 165.

Pullorum bacilli and Tubercle bacilli developed very well in normal eggs, but in eggs with a high percentage of iodine they had no chance of development.

*The Iron and Copper Content of Egg Yolk.* S. E. Erikson, R. E. Boyden, J. Holmes Martin and W. M. Insko, Kentucky Bulletin No. 342, June 1933.

**Summary and conclusions:**

1. Investigation was made of the iron and copper content of the yolk of eggs produced by hens from six different pens, the differences in treatment being the administration of cod liver oil, sunshine and blue-grass range.

2. Addition of two percent of cod liver oil to the basal ration of hens raised the percentage level of both copper and iron values in the egg yolk.

3. Sunshine admitted directly to hens that did not have cod liver oil raised the percentage levels of copper and iron values in egg yolk over those of hens that received sunlight only thru ordinary window glass.

4. Sunshine admitted directly to hens that were given cod liver oil decreased the level of the iron but raised the level of the copper content of egg yolk over the eggs of hens that received sunshine only thru ordinary window glass. The effect of sunshine and cod liver oil on copper content seemed to be cumulative but on iron content the two seemed to have antagonistic effects.

5. Eggs produced by hens that received cod liver oil only, show higher percentage values of iron in the yolk than those produced by hens that received both cod liver oil and sunshine, and these in turn show higher values than those from hens allowed open bluegrass range and cod liver oil.

6. Hens allowed sunshine, bluegrass range and cod liver oil produced eggs having a higher copper content in the yolk than those from any other pen. The value was two and a half times as great as that of eggs produced in the pen confined without cod liver oil or direct sunshine or bluegrass.

*The Relation of Yolk Index to the interior Quality by Candling and from the opened Egg.* G.F. Stewart, A. R. Gans and P.F. Sharp, Cornell University, Ithaca, N.Y. The U.S. Egg and Poultry Magazine, Nov. 1932.

Summarizing the results from this study, we find that two of the four candlers seem to score down yolk visibility as the yolk index decreases. All candlers score down the white, grade, and air cell size with decreasing yolk quality. The extent to which the air cell size influences these first two scores is not now known, but that it is effective is clearly evident. Further study of its influence is warranted.

*A new Method for determining the Quality of an Egg.* R. R. Haugh, U. S. Egg and Poultry Magazine, March 1933.

To overcome the defects in the method of measuring by yolk index author has devised a method for measuring the amount of internal pressure in the yolk that will cause the yolk sack to break or rupture. This method is independent of the temperature or the size of the yolk. The device can be easily and quickly operated.

*Egg yolk color.* W.C. Russell and C.S. Platt, New Jersey Agriculture, 1933, p. 6.

Preliminary results have shown that replacing yellow corn with white corn and omitting green plant tissue from the ration of laying pullets resulted in the production of eggs with pale lemon yellow yolks. The egg production and egg quality were essentially the same for the white and yellow corn groups.

*The vitamin D potency of egg yolk from irradiated hens.* G. H. and E. Maughan, Science, 77, 1933, p. 198.

The relative antirachitic potency of egg yolk from irradiated hens was tested in five experiments at the [New York] Cornell Experiment Station. Eggs were tested from a flock receiving both cod-liver oil and ultraviolet rays, a flock receiving cod-liver oil, and a farm flock receiving a poorly balanced ration.

The results confirmed previous investigations showing that egg yolk contained appreciable amounts of vitamin D. Irradiating hens with ultra-violet rays markedly increased this vitamin above the quantity normally found in eggs. Rachitic rats fed a ration containing 5 percent of egg yolk from irradiated hens were cured as rapidly as similar rats exposed to ultraviolet light. Ten percent of this egg yolk was as effective in a rachitogenic diet as 0.5 percent of cod-liver oil. Nonirradiated hens having access to autumn sunshine produced egg yolks with sufficient vitamin D to cure rickets. However, as the winter advanced and the length of the production period increased, the vitamin D content of the eggs diminished to a low level. There appeared to be a limited ability for hens to store vitamin D and transfer it to the eggs. The tests with the farm flocks showed that eggs as ordinarily purchased contained varying amounts of vitamin D. The season of the year and volume of production were at least two factors determining these amounts.

*Effect of ration on yolk color.* E. W. Henderson and H. L. Wilcke, Poultry Science, 12, 1933, No. 4, pp. 266-273, pl. 1, fig. 1.

At the Iowa Experiment Station a study was conducted to determine whether or not factors other than the feed of the bird influenced the color of the egg yolks produced. Special attention was given to the possible influence of the abdominal fat on yolk color.

The results showed that the pigment of the ration was primarily responsible for the color of the egg yolk. Feeding dyes with the ration showed that the hen does not withdraw Sudan III from her body fat for deposit in the egg yolk. It required from 3 to 5 days for the feed to exert the initial visible influence on the color of the yolk, depending upon how soon production starts after feeding begins. The effect of the dyes may remain evident for as long as 20 days after dye feeding stops, depending upon the rate and time of production. The maximum effect of dye was obtained in approximately 14 days, but this also depended upon the rate of production. The time required for the development and production of an egg varied with individual hens.

*Osmotic relationships in the hen's egg.* J. M. Johlin, Jour. Gen. Physiol., 1933, p. 605.

In this article the author presents data to illustrate the difficulties met in obtaining consistent freezing point data with the yolk of the hen's egg. A technic is described for obtaining reproducible and accurate results consistently.

The data showed a pronounced difference between the freezing points of the yolk and the white. The freezing point determination showed that even in a mixture of yolk and white osmotic equilibrium was arrived at slowly.

*The iodine content of hens' eggs as affected by the ration.* O. H. M. Wilder, R. M. Bethke, and P. R. Record, Jour. Nutrition, 6, 1933, No. 4, p. 407.

At the Ohio Experiment Station four lots of 10 Leghorn hens each were fed the same basal ration. After sufficient iodine determinations had been made while the birds were on the basal ration, the diets were changed so that lot 1 continued on the basal ration, lot 2 had potassium

iodide added, lot 3, 2 percent of kelp, and in lot 4 the meat scrap was replaced by an equivalent amount of Menhaden fishmeal protein. In a second test three lots of six pullets each were fed the same basal ration, to which was added in the respective lots dried kelp, iodized linseed meal, and potassium iodide evaporated on dextrin.

Analyses of the eggs and rations showed that the iodine content of hens' eggs varied directly with the amount of this element in the diet. Adding 2 and 5 mg of iodine per bird daily in the form of dried kelp, iodized linseed meal, or potassium iodide increased the iodine content approximately 75 and 150 times, respectively. Upon discontinuance of iodine feeding the percentage of the element in the eggs decreased at once. The form in which iodine was fed had no effect upon the amount in the egg.

*Is the production of off-flavor eggs an individual bird characteristic?* J.H. Vondell, U.S. Egg and Poultry Mag., 39, 1933, No.4, p. 18.

A study at the Massachusetts Experiment Station showed that off-flavored eggs, commonly called "fishy eggs", were produced by a few individuals in a flock. The evidence indicated that such eggs were probably caused by an inherited ability to produce eggs with an unbalanced proportion of chemical constituents. The odor was always present in the yolk. There was considerable variation between individuals in the percentage of off-flavored eggs produced and in the intensity of the odor.

*The iron and copper content of egg yolk.* S.E. Erikson, R. E. Boyden, J. H. Martin, and W. M. Insko, Jr., Kentucky Sta. Bul. 342, 1933.

Continuing this study of factors that may affect the nutritive quality of eggs, eggs from various lots were broken, the yolks and whites separated, and the yolk analyzed for copper and iron content. A total of 420 yolks was examined for iron and 212 for both iron and copper.

The results of the analyses showed that the addition of 2 percent of codliver oil to the basal ration raised the percentage level of both copper and iron values in egg yolk. Direct sunshine increased the copper and iron percentage levels of yolks from hens receiving no cod-liver oil over those of hens receiving sunlight only through ordinary window glass. The level of iron in the yolk of eggs from hens receiving direct sunshine in addition to cod-liver oil was decreased, but the level of copper was raised as compared with the eggs of hens that received sunlight only through ordinary window glass. Hens receiving cod-liver oil only produced eggs showing higher percentage values for iron in the yolk than were produced by hens receiving both sunshine and cod-liver oil, while the latter showed higher values than eggs from hens on open bluegrass range and cod-liver oil. Hens receiving sunlight on grass range and cod-liver oil produced eggs with a copper level 2.5 times greater than did eggs from hens confined without sunshine or cod-liver oil.

# WHITES

*Watery Whites of Eggs. Report of Preliminary Investigations.* A. S. Canham, Veterinary Research Officer, Allerton, Pietermaritzburg, republished from Onderstepoort Journal of Veterinary Science and Animal Industry, The South African Poultry Magazine, Jan. 1934.

## Summary :

(a) The method of testing eggs by means of the candle is not an exact method for showing whether an egg is a watery white egg or not.

(b) It is reliable for showing whether or not the albumin lining membrane is ruptured or not.

(c) Under the present conditions it is, however, the only method that can be used.

(d) All eggs showing air bubbles or a bubble are not watery white eggs.

(e) Many eggs not showing air bubbles or a bubble are definitely watery white eggs.

(f) The poultryman's porous shelled egg as distinct from a thin brittle shelled egg is in the majority of cases decidedly not porous.

(g) Many shells which on being tested by stain are markedly porous, are, when placed over the candle prior to staining, apparently normal shells.

(h) The longer an egg is kept the more porous the shell becomes.

(i) Porosity does not seem to play an important part in the causation of watery white eggs.

(j) In all eggs showing air bubbles or a bubble the inner shell membrane covering the albumin is ruptured.

(k) There is not much variation in the percentage of shell weight to total egg weight between normal and watery white eggs.

(l) Definite watery white eggs showed a maximum percentage of thin albumin of 93.7 per cent.

(m) Normal eggs kept for varying intervals became in many cases definite watery white eggs although this could not be shown over the "candle".

(n) The reaction of the albumin of normal and watery white eggs was practically similar.

(o) There are probably a number of causes all acting together or at times separately to set up watery white eggs.

(p) These are probably warmth, vibration or movement, storage or age of eggs, excessive porosity in a few cases, and probably the result of strain in hens towards the close of a heavy egg-laying period in a further number of cases.

*Nature of Watery Whites in Eggs.* J. L. St. John and A. B. Caster, Agric. Exp. Station, Pullman, Washington, Bull. No.291, Jan. 1934.

It has been shown in this laboratory that the thin or "watery" portion of egg white is at least as suitable as the thicker portion, and probably more so, for whipping and for uses such as the making of angel food cake. Undue discrimination against eggs with "watery whites" apparently, therefore, has been made in the past. Additional data have



been accumulated to show the nature of the difference between "watery" and firm whites and a critical study of methods of determining these differences is being made. Further data are ready for publication.

*Formation of thin White.* A. K. Balls and T. L. Swenson. U. S. Egg and Poultry Magazine, August 1934.

Authors have come to the conclusion that both changes, the alteration of thick to thin white and the change in the yolk membrane have the same cause. The thick white did contain quite a lot of a protein-splitting enzyme, but the thin white contained some substance which prevented this protease from acting. The enzyme in the thick white turned out to be trypsin. After injection with trypsin into the thick white of normal eggs in a few hours at room temperature the injected eggs showed a large increase in the proportion of thin to thick white. The yolk membranes were likewise weakened. The appearance of perfectly fresh eggs about twelve hours after injection with trypsin resembled that of untreated eggs after six to eight months cold storage. It was showed that the chief protein of the thick white (mucin) was chemically changed by the enzyme action.

*The Cause of 'Watery Whites' and Other Defects of Eggs in Shell.* E. T. Halnan, Notts. Educ. Comm. County Poultry Handb. 1933, p. 9.

This article is a popular one dealing with the causes of defects in eggs. Taint, or bad flavour or odour is generally associated with the use of unsuitable packing material, or contact of the eggs with materials possessing strong odours. Fishy taint in eggs is due to a similar cause, since inclusion of as high a content of fishmeal as 15 per cent in the ration does not lead to taint if care in handling and collection is observed.

Meat spots are due to inclusion of portions of the egg follicle or capsule which break off from the ovary, and blood spots and blood eggs are caused by rupture of capillaries of the follicle or upper membranous portion of the oviduct.

Pale or badly coloured yolks are shown to be due to feeding. Watery whites are shown to be of two types, the first type, characterised by irregular or a trembling air space is shown to be due to bad transport conditions and can be reproduced at will in any egg by shaking. The second type, characterised by running air cells, is associated with rupture of the egg membranes and appears to be an inherent fault of the egg itself.

*The Effect of different Methods of Packing on Quality of Eggs.* W. H. Dryden, Ministry of Agriculture, Northern Ireland, Harper Adams Utility Poultry Journal, Vol. 19, No. 5, 1934.

In the course of these investigations evidence accumulated which pointed strongly to the assumption that eggs which were packed air cell or broad end up, whether in transit or undisturbed in store, would remain in good condition longer than those packed air cell or broad end down.

**Conclusions :**

1. The presence of a tremulous air cell or running air cell does not indicate that the egg has a "watery white" or is "weak".

2. Eggs containing tremulous air cells or running air cells should not be excluded from first quality grade eggs provided that there is no sign of deterioration in other respects.

*Relative Amount of Mucin in thick and in thin Egg White.*  
E. Mc Mally, U. S. Egg and Poultry Magazine, December 1933.

In studying the proteins of egg white author has found that the thick portion of the white contains a much higher proportion of a protein possessing the properties of mucin than the thin white. This unequal distribution of mucin is not confined to the egg of the hen. It is possible that in the formation of eggs the mucin secretion and the serous secretion are poured out together and that the mucin particles coalesce, holding a certain amount of thin white, and that the volume of thick white varies with the changes in hydrogen-ion concentration. Mucin may have a role in the regulation of the exchange of materials during incubation between the embryo and the several other parts of the egg and the surrounding atmosphere.

*Breed Differences, Effect of Egg Weight and antecedent Production in Respect of thick Albumen.* C.W. Knox and A. B. Godfrey, U. S. Egg and Poultry Magazine, December 1933.

**Summary :**

1. Egg weight is correlated with the total albumen weight and thick albumen weight in both the strains of White Leghorn and the Rhode Island Red studied.

2. Egg weight is not correlated with the percent of thick albumen in the strain of either breed.

3. Antecedent egg production has apparently no correlation with the total amount of albumen, the weight of the thick albumen, nor with the percent of thick albumen.

4. There is a significant difference between the eggs laid by the one strain of White Leghorns and those laid by one strain of Rhode Island Reds studied in respect to egg weight and percent of thick albumen.

*The Effect of Milk on the Whipping Quality of Egg Whites.*  
V. R. Dizmang and G. Sunderlin, The U. S. Egg and Poultry Magazine, Nov. 1933.

Substance Added to Egg Whites	Largest Number of Drops Permitting Foam Stiff Enough to Stay in an Inverted Bowl
20 % Cream . . . . .	1—2
Whole Milk . . . . .	2—3
Sterilized whole milk . . . . .	8
Reconstituted powdered whole milk . . . . .	50—70
20 % cream homogenized at 3000 lbs. . . . .	70
Evaporated milk . . . . .	50—350
Separated milk . . . . .	400—446
Whole milk homogenized at 2500 lbs. . . . .	400—450
Whole milk homogenized at 3000 lbs. . . . .	1000
Reconstituted powdered separated milk . . . . .	1600

Homogenisation subdivides the fat globules into very small particles, thus greatly reducing their size and causing the fat to be more uniformly and permanently dispersed throughout the liquid.

*The solids content of egg white.* H. J. Almquist and F.W. Lorenz, Poultry Science, 12, 1933, No. 2, pp. 83-89, fig. 1.

Continuing this study at the California Experiment Station, it was found that the mean solids content of the layers of white in any one egg was that of the middle layer of firm white. After short storage periods, the solids content of the different layers of white became the same. An explanation of some commercial "watery whites" lies in the fact that the layer of firm white holds an inner layer of liquid white, and the rupture of the firm white envelope permits the inner liquid white to run out, producing an apparent liquefaction. The ash content was practically constant for the layers of white, and was independent of variations in total solids content. While the solids concentration in the whites of fresh eggs was quite variable, the eggs from one hen were more uniform in this respect than random samples.

## SUNDRIES

*Studies on specific Gravity of Hens' Eggs. A new Method for determining the Percentage of Shell in Hens' Eggs.*  
N. Olsson, Agricultural School, Hammenhog, Sweden.  
Editor: Otto Harrassowitz, Leipzig.

### Summary:

1. No significant correlation exists between the total weight and specific gravity of new-laid hens' eggs, produced under similar conditions.
2. The positive correlation existing between the total weight and the volume of the eggs is so high that it may be considered as complete.
3. The specific gravity of yolk, albumen, shell, and shell membranes in new-laid hens' eggs was investigated with the following results:

	Mean	Standard-deviation
Specific gravity of yolk	$1.032 \pm 0.0003$	0.0038
" " " albumen	$1.038 \pm 0.0004$	0.0036
" " " (mixed)		
" " " shell	$2.325 \pm 0.0149$	0.0631
(membranes removed)		
	Limits	
" " of shell membranes	1.005 — 1.010.	

4. After the eggs have cooled down to room temperature i. e. about 2 hours after being laid, the volume of their air cells is found to be positively correlated with the weight (volume) of the eggs, the coeff. of correlation,  $r = 0.51 \pm 0.060$ .

5. A high positive correlation exists between the specific gravity and the percentage of shell weight of the total weight in hens' eggs immediately after they are laid. The specific gravity of eggs is therefore a good measure of their percentage of shell.

6. With normal percentage of shell in a population of eggs the mean of the eggs' specific gravity lies between 1.085 — 1.090 when the estimation is made immediately after they are laid.

*Form and Volume of Eggs. Gestalt und Volumen von Hühnereiern.* Prof. Dr. J. Grossfeld, Berlin, Archiv für Geflügelkunde, Vol. 7, p. 374.

**Summary:**

According to Szielasko a plain through the longitudinal axis of a bird's egg is limited by a peculiar curve, a so-called "egg-curve", which under mathematical aspects is a part of the Cartesian Oval. The egg-curve corresponds to the equation  $S_1 + mS_2 = C$ , in which  $S_1$  and  $S_2$  are the radiivectores from the two foci of the egg body,  $m$  a constant figure and  $C$  a constant distance. The average as ascertained by measuring 113 fowls' eggs was:  $m = 0,78$ ,  $C = 89,0\%$  of the length of the egg in question.

In the calculation of the volume of eggs the influence of the figure  $m$  proved to be so small, that it is negligible. The volume  $V$  of the hen's egg can be calculated by means of the equation showing only an average deviation of  $\pm 0,6$  cc.  $L$  and  $B$  are ascertained by way of direct measurements with a slide-gauge.

*Examination of Eggs. Beitrag zur Untersuchung von Eiern.* F. W. Vilter and O. Schmidt, Zeitschrift zur Untersuchung der Lebensmittel, Vol. 65, 1933, p. 649.

Eggs, from which the stamp has been removed, show, under the quartz-lamp a strengthening of the shell colour. This appears also if the shell has been cleaned. Eggs, conserved in lime, show after treatment with sand a clear red colour.

*Examination of Eggs in ultraviolet Light. Untersuchung der Eier im Ultraviolettlicht.* A. Schrempf, Zeitschrift für Untersuchung der Lebensmittel, Vol. 65, 1933, p. 647.

The stamp on the eggs can be removed by several manners of treatment, some of which are indicated by the author. By the scraping off of the stamp, the porphyrine, which causes the fluoreescency of the shell, will be more or less removed, and dark spots will be an indication thereof. By the employ of acids, the carbonate of lime will be affected, not the porphyrine. In some cases the stamp-colouring will yet fluorescence in the depth of the shell-pores. In some cases the finger prints of the persons who dipped the eggs into the acid were quite easily discernible.

*Examination of the Influence of Keeping in Cold-Storage. Bemerkungen zur Abhandlung "Untersuchungen über den Einfluß der Kühlhauslagerung bei Hühnereiern.* Dr. Eble, Zeitschrift für Fleisch und Milchhygiene, Vol. 44, 1934, p. 286.

The author discusses the study of Prof. Beller, having the same name. He defends the method of Ebler, whereby the age of the eggs after dialysis, is colimetrically determined. Prof. Beller came to the conclusion, that this method does not yet give complete security.

*Factors affecting the keeping qualities of eggs.* W.H. Dryden and R. W. Hale, Agr. Prog. (Agr. Ed. Assoc., London),

10, 1933, pp.92-99. (Ref. Exp. St. Record, Vol.70, 1934, p.229.)

A series of tests was undertaken at the Agricultural Research Institute of Northern Ireland to study some of the causes of poor storing qualities of eggs.

The main factor governing the keeping quality of eggs was the season of the year. Under trade conditions it was doubtful whether extremes of feeding had any effect on keeping quality. There was no appreciable difference in the keeping quality of eggs from hens confined in pens and from hens on free range. The rate of production was apparently not related to keeping quality. Eggs that were stored and left undisturbed kept better than those in transit. Eggs packed with the air cell up remained in good condition longer than those packed with the air cell down. The presence of a running or tremulous air cell when eggs were candled did not necessarily denote poor keeping quality.

*Effect of washing on the keeping quality of hens' eggs.* R. L. Bryant and P. F. Sharp, Jour. Agr. Res., U. S., 1934, p.67.

The data reported in this paper from the [New York] Cornell Experiment Station were obtained in a study designed to determine the effect on the keeping quality of eggs of washing and of the type of solution used in washing. A few comparisons were also made between cleaning by washing and by dry abrasion.

Eggs that had been washed with a number of different solutions did not lose weight more rapidly during storage at high temperatures than did unwashed eggs. Oil-dipped eggs lost less weight in storage than did eggs that were not oil-dipped. Loss in weight up to 7 percent was shown to be a linear function of time, at constant humidity and temperature, and was not influenced by washing. A correlation of  $+0.45 \pm 0.057$  was found between the number of pores in the egg-shell and the loss in weight of the egg and a correlation of  $+0.258 \pm 0.033$  between the number of pores and shell strength. Cleaning by sand blast increased the porosity and rate of loss in weight.

The possibility of infection from bacteria through the relatively few large pores of the shell is pointed out. Germicidal action of egg white having a high pH value was shown at temperatures from  $0^{\circ}$  to  $40^{\circ}$  C. It was concluded that deterioration of washed eggs was due to bacterial infection of the egg from the dirt on the shell, and that subsequent washing did not reach the organism which had already entered the egg. The only effective remedy lay in preventing eggs from becoming dirty.

*Can the Removal of Stamps from Eggs be Proven? Läßt sich die Entfernung von Eierstempeln nachweisen?* Eier-Börse, 26. Juli 1934.

In the "Deutsche Nahrungsmittel-Rundschau" we read in No.16 of the 16th July 1934 the following article: "The evidence of removal of the stamp on eggs, will be successful according to Braunsdorf (Zeitschr. f. Unt. der Lebensm. 1934, Bd.67, S.451) by colouring them for one hour in a Fuchsin dilution and, if necessary, by inspection under the quartz-lamp.

*A Small Egg in a normal Egg. Inclusion dans un Oeuf normal, d'un petit Oeuf muni d'une Coquille complète.* J. Cocu, Bulletin de l'Académie Vétérinaire de France, Vol. VII, 1934, p. 78.

Description of a small egg, which was found in the white of a normal egg. The small egg did not contain any yolk.

*Four Ounce Eggs from Manchuria. Vier Unzen Eier aus der Mandschurei.* Taiji, Kohmura, Journal of Heredity, Vol. 22, 1931, p. 77.

In spite of the high age of the poultry breeding in China (4000 years) very little is known regarding the domestic chicken in Manchuria. The most divergent types, as regards comb and plumage, are to be found there, they lay, on the average, about 100 eggs per year, a hving a weight of 50-60 grams. A special type is supposed to excell in the laying of eggs of a higher weight (100 gr.), by a yearly capacity of about 60 pieces. The author acquired 8 cocks and 25 hens, in order to examine the statements. One of these hens laid one single yolk egg of 113 grams, otherwise the weight per egg was 80-90 grams. One hen laid within one year 77 eggs with an average weight per egg of 97.8 grams, an other hen 52 eggs with an average weight of 94.9 grams. The hatch-capacity was very low. The author thinks it quite possible that a strain can be bred with a yearly capacity of 150-200 eggs with 75-80 grams.

*Observations on the Air Chamber of the Egg. Observatiuni asupra camerei de aer la ouale de gaina.* Arh. Veterinara No. 5, Bukarest 1931 (Ref.: Züchtungskunde, March 1934).

The author has observed the development of the aire-chamber on 1511 eggs. It appears within one minute up, to twelve hours after the egg has been laid. Usually it forms itself within 7-60 minutes. In winter is forms itself quicker than in summertime, which must be attributed to the great change in the temperature. The air-chamber appears suddenly as a dark disc of a diameter of 0.5-0.9 cm. Within the first two hours it enlargens itself rapidly up to 1.3-1.5 cm diameter, from there on only by 0.05-0.1 cm daily. The divergencies in the appearance of the air chamber are not to be regarded as racial, but as individual.

*Some analyses of egg-shell keratin.* H. O. Calvery, Jour. Biol. Chem., 100, 1933, No.1, pp. 183-186.

The author removed the contents of eggs not more than one day old, washed away the adhering white, suspended the shell material in hydrochloric acid of a concentration of from 3 to 5 percent to remove inorganic substances, and, after washing the crude shell protein, digested for several days in a pepsin hydrochloric acid medium to dissolve digestible proteins. The keratin preparation resulting from these treatments was thoroughly washed with distilled water, dehydrated by means of alcohol and ether, and dried under reduced pressure over sulfuric acid. Eighty g of the protein were obtained from the shells of 800 eggs.

This material was found to contain ash 0.05 percent, moisture 8.6, nitrogen 16.57, and sulfur 3.78 percent; and it yielded the amino acids,

tyrosine 2.54 percent, glycine, alanine, valine, leucine, proline 3.83 percent, glutamic acid 10.11, aspartic acid 3.38, tryptophan 2.61, cystine 12.67, arginine 8.88, histidine 0.86, and lysine 3.66 percent. With these figures are tabulated for comparison the data from such previous determinations as have been recorded.

*The world egg Trade-Facts and Fallacies.* S. C. Barry, Department of Agriculture, Ottawa, Canada, Poultry Science, Vol. XI, 1932.

In 1900 fifteen countries participated in the egg import trade of Great Britain. By 1930 this number was increased to twenty-eight. Germany, the second largest importing country, drew her 1930 imports of 220 million dozen from thirtyone different countries. There are in the entire world approximately eighty-five countries and dependencies. Of these, sixty-two appeared in the international egg trade figures of 1930. Of those that did not appear in trade figures all but three in South America and one in Central America were in Africa and Asia.

The most notable developments of the past decade have been the tendency on the part of Great Britain and Germany, the two largest importers, to produce more of their own requirements, and the trend towards greater production and exports in the Southern Hemisphere, principally in South Africa, Australia, and Argentina. These countries are favourably situated to export to the Northern Hemisphere by reason of the fact that their flush spring production comes during our winter months.

With increasing production and increasing export competition additional outlets are necessary in order to maintain a well-balanced international trade. As eggs are now being used in practically all civilised countries the most practical way to broaden demand is by offering a dependable, graded product to consumers.

Within the past ten years legislation affecting the egg trade has been introduced by a number of the more important exporting and importing countries. For the most part this legislation has not been such as to identify quality to consumers and in this way increase consumption. It is contended that a broader application and appreciation of grading by all countries would be in the interests of the poultry industry and of the international egg trade.

*Temperature and its effect on egg size in the domestic fowl.* N. L. Bennion and D. C. Warren, Poultry Science, 12, 1933, No. 2, pp. 69-82, figs. 3.

Based on the records of the poultry flock at the Kansas Experiment Station during the years 1921-22 and on 32 White Leghorns kept in individual batteries in a temperature-controlled room in 1932, this study was made to determine the effect of temperature on egg size. Daily maximum and minimum temperatures for these periods were used in this study.

The mean weekly egg weight compared with the mean weekly temperature showed a sharp decline when the temperature was over 85° F. Under controlled conditions the application of high temperatures reduced the mean daily egg size from 15 to 20 percent, and the rate of decline was more rapid than the increase when the temperature was lowered. While all the components of the egg decreased under high temperature, the shell and albumen decreased proportionately more than the yolk, indicating that the oviduct was more sensitive to high tempera-

tures than the ovaries. Birds were more sensitive to sudden changes in temperature than to gradual changes, but extremes of temperature in either direction were followed by a decline in production. When exposed to high temperatures, birds consumed 12 percent less feed than at moderate temperatures, but this factor was not responsible for the decline in egg size.

White Leghorns and Rhode Island Reds reached their maximum egg size during the early part of February, and from that date until summer temperatures began to have their effect there was little fluctuation in size. The results also indicated that a dependable measure of an individual's maximum egg size could be obtained by weighing the first 10 eggs produced in April. When comparing egg size of birds from different parts of the country, the temperature and its effect on egg size should be taken into consideration.

*The effect of ground soybeans on the cold storage quality of eggs.* A. E. Tomhave and C. W. Mumford, Poultry Science, 12, 1933, No. 1, pp. 37-41.

In tests at the Delaware Experiment Station, eggs produced by hens receiving rations containing varying amounts up to 10.4 percent of ground soybeans were placed in cold storage for periods of 4, 6, and 9 months. The eggs were produced during the month of May, and no egg was more than 4 days old on the date of storage.

Practically no difference was found in the keeping quality of eggs produced from rations containing as high as 10.4 percent of ground soybeans and from rations containing no soybeans.

*Relation of the candling appearance of eggs to their quality.* H. J. Almquist, California Sta. Bul. 561, 1933.

In an effort to stimulate thought and investigation on egg quality problems, the author has collected and summarized the present technical knowledge of the physical and chemical structure of eggs as related to the problem of grading eggs. Some of the information given includes original results.

The work is divided into three parts—(1) the yolk shadow, in which factors affecting color, position of the yolk, and cloudy whites are discussed, (2) air space, which is devoted to changes in the size and defects of the air space, and (3) shell texture, in which mottled shells and shell porosity are discussed. A portion of the bulletin is devoted to general remarks on the commercial grading of eggs.

*A study of egg flavor in stored oil-treated eggs.* R. R. Slocum, A. R. Lee, T. L. Swenson, L. H. James, and M. C. Steinbarger, U. S. Egg and Poultry Mag., 39, 1933, No. 4, p. 14-17, 47.

In a cooperative study between the U. S. D. A. Bureaus of Chemistry and Soils, Animal Industry, Home Economics, and Agricultural Economics, five lots of eggs were stored from March to December to determine the effects of mineral oils on the flavor of the eggs out of storage and to compare these results with the candled grades of the eggs. The temperature of the storage room was maintained at from 29° to 30° F., with a relative humidity of from 89 to 90 percent. At the end of the storage period the eggs were regraded, cooked in boiling water for 3 minutes, and the yolks sampled by taste.



The results showed that the deteriorative changes in eggs during storage, which resulted in low grading before the candle, were not necessarily accompanied by off flavors. On the other hand, objectionable flavors may occur in storage eggs that graded high when candled. The colorless, tasteless, and odorless mineral oils of widely different specific gravities and pour points used for preserving the eggs during storage did not adversely affect the flavor.

*Eggs and egg products.* U. S. Dept. Agr., Bur. Chem. and Soils Rpt., 1933, p. 18.

Results are reported for studies on the cause and prevention of deterioration of eggs during storage.

*A method and the apparatus for the study of permeability of gases through the bird's eggshell.* A. L. Romanoff, Science, 1933, No. 1999, p. 393.

In this article from the [New York] Cornell Experiment Station, the author describes an electric apparatus for the direct and accurate measurement of the permeability of the bird's eggshell to various gases.

*The role of mineral oil in egg quality preservation.* T. L. Swenson and L. H. James, Amer. Creamery and Poultry Prod. Rev., 76, 1933, No. 19, p. 618.

The amount of oil remaining on the surface of eggshells following oil treatment was determined by the U. S. D. A. Bureau of Chemistry and Soils. Eggs were allowed to drain for 3 min. and were then wiped with weighed, dry squares of absorbent cloth, the increase in weight showing the amount of oil absorbed. Determinations were made on eggs treated at atmospheric pressure and by the vacuum-carbon dioxide method at both 110° and 150° F., respectively.

Eggs treated by the vacuum-carbon dioxide method had less oil adhering to the surface than eggs dipped at the atmospheric pressure. Eggs having the greatest amount of adherent oil were no better protected than eggs which took up less oil. A large portion of the oil adhering to the surface of vacuum-treated eggs was taken into the pores. The temperature of dipping had little effect on the amounts of oil adhering to the shell surface. Tests with oils of different physical constants showed little change in the amounts of ether-soluble material on eggshells and membranes before and after storage.

## TABLE POULTRY

### *Organized Egg Marketing in Germany.*

In pursuance of the Decree for the organization of the egg market in Germany, referred to in the March issue of this Journal, regulations have been issued providing for the reorganization of the marketing of German eggs.

For the purposes of the new system, the country is divided into fifteen districts, in each of which a District Commissioner is to be responsible, under a Reich Commissioner, for the collection and disposal of the local output of eggs. In each district local collecting stations are

to be established, to which producers, unless conditionally exempted as producer-packers, are required to send all eggs not required for consumption in their own households or for sale direct to consumers. As far as possible, existing co-operative societies are to be used as collecting stations; in other instances, independent buyers of eggs are to be given preference for appointment as managers provided that they give up trading on their own account.

The collecting stations must dispatch all their supplies to packing stations, the main functions of which will be to grade and mark eggs in accordance with the provisions of the Egg Decree. With the exception of such quantities as they are able to sell direct to consumers, the packing stations must, in turn, place the eggs supplied to them at the disposal of central district offices. These offices will undertake the sale of eggs within their districts in accordance with the instructions of the District Commissioners. For this purpose they will, in general, utilize the services of the whole-sale trade.

All supplies that cannot be disposed of in their area by the district offices must be consigned to or on the instructions of a Central Sales Office. Alternatively, if there is a deficiency of supplies in any district, additional supplies must be obtained through the Central Sales Office. The primary functions of the Central Sales Office will be to effect an adjustment between the districts in which there is a surplus of supplies and those in which there is a shortage, and to arrange, in conjunction with the Reich Egg Office, for the holding of stocks.

The regulations also provide for a measure of horizontal organization. This is to be effected by the local grouping of collecting and packing stations into supply associations, based, presumably, on the packing station as the central nucleus. The District Commissioners are empowered station as the central nucleus. The District Commissioners empowered to appoint Sub-commissioners for each supply association. The supply associations are in turn to be combined in a marketing federation for each district. The main purpose of this horizontal organization is to ensure the uniform execution of the instructions issued by the District Commissioners.

Finally, the District Commissioners are given authority to control prices and price margins, subject to the approval of the Reich Commissioner. They are to fix the prices at which collecting and packing stations are to settle accounts with producers, the prices paid by the district offices to packing stations as well as the prices at which the district offices may sell to the trade, and they are to ensure that the prices and price margins so fixed are maintained. Contravention of the regulations is punishable by monetary fine, subject to the right of appeal to an arbitration court, the ruling of which is final.

### *North Holland Blues. A new table Breed. Poultry Record, 1934, p. 111.*

Anew breed of table fowl now receiving the attention of Dutch poultry farmers is the North Holland Blue, which is stated to possess two distinctive qualities, that of white flesh and rapid growth. For the past twentyfive years the district to the north of Amsterdam, Holland, has been noted for the production of table poultry, but beyond the quality of its product no special attention was paid to a standardized breed. A group of poultrymen have now adopted a standard for the North Holland Blue which in appearance suggests an over-size barred Plymouth Rock. Crosses used in the production of this new breed were

the Cocou de Malines, a barred fowl, the barred Rock—which, however, was not favored on account of the yellow skin—and the Sussex. The Dutch standard of the North Holland Blue is as follows:

#### General Characteristics.

The Cock: Head large and round. Beak strong and well curved. Eyes bold and prominent. Comb single, erect, evenly serrated and of fine texture. Face smooth and free from wrinkles. Earlobes long and narrow. Wattles smooth and moderately long. Neck strong, well curved. Body deep and broad, sloping slightly towards the tail, but with high set saddle; breast broad, carrying a lot of flesh; back long, inclined to slope; wings well developed, carried closely to the body, and horizontally; tail moderately developed, carried fairly high, with sickle feathers of medium length and tail coverts showing. Legs moderately long, with wellfleshed thighs and strong shanks, free from feather. Carriage heavy without exaggeration, drawn out a little and sloping slightly backwards. Moderately wide stance. Plumage fairly loose. Weight 9 lbs. (minimum).

The Hen: The general characteristics are similar to those of the cock, allowing for the natural sexual differences. Weight 5 lbs. 5 ozs. (minimum).

#### Color.

Beak ivory. Eyes orange. Face and earlobes red. Legs and feet white. Plumage cuckoo. Light grey ground with dark bars running regularly through (across) the feathers. Bars not sharply defined, but tending to merge with the light ground. Ground color of cock lighter than that of hen.

Eggs: Weight  $2\frac{1}{4}$  ozs. (minimum); color, light brown.

*Does the So-Called "Throat Cutting", applied to Chickens Guarantee a complete Bleeding and quick death? Gewährleistet der "innere Halsschnitt" vollständige Ausblutung und schnelle Tötung der Hühner? Schönberg, Zeitschrift für Fleisch und Milchhygiene, Vol. 33, 1934, p. 142.*

In connection with an article written by Grzimek, wherein he concludes, that according to the anatomical relationship of the blood vessels in the vicinity of the larynx of the chicken, the killing by cutting the throat directly behind the beak of the chicken, does not always guarantee that all the neck vessels, especially both the carotides have been cut, and that therefore a complete bleeding to death of the animal cannot take place, Schönberg has examined 33 chickens, confiscated at the Berlin poultry market, and which had all been killed in the above described manner, as to how far the neck blood-vessels had been cut.

He discovered, that only with three animals not all the vessels had been cut, i. e. in one chicken the two carotides were not severed and in 2 chickens, the carotis had, respectively been cut only on one side.

This insufficient cutting will be met with especially if the throat cut has been made to far towards the neck; this has also the result, that the animals do not bleed completely, owing to the fact that a blood sack will be formed under the skin of the neck. This part of the neck, will, when the killed chicken is kept too long, for instance in a market, etc. go very quickly over into decay.

Schönberg reaches therefore the conclusion, that, if the throat cut has been executed properly, all the main neck blood-vessels will always be cut, and that, besides a quick death a good bleeding will also be obtained.

*Inspection of Table Poultry. Die fleischbeschauliche Beurteilung des geschlachteten kranken und krankheitsverdächtigen Geflügels.* Prof. Dr. A. Eber, Berliner Tierärztliche Wochenschrift, Vol. 50, 1934, p. 196.

Different diseases are mentioned, which make the consumption of the flesh unsuitable for man.

*Meat on the farm.—Part 4, Killing and dressing poultry.* O. A. Barton, North Dakota Sta. Circ. 50, 1933, pp. 12, figs. 8.

The generally accepted practices in killing and dressing poultry for home use, together with some of the more recently developed methods and practices employed at commercial killing plants, are presented in this publication.

*Meat production in poultry.* W. A. Maw, U. S. Egg and Poultry Mag., 39, 1933, p. 18.

This is a preliminary report of a study at Macdonald College to determine whether there is any relationship between "body type", as designating difference in body measurements, and the rate of growth and amount of edible meat on the carcass of the bird. Broilers at 10 weeks of age and roasters at 26 weeks of age from different types of birds, represented by pure breeds and certain crossbreeds, were studied.

At 10 weeks of age Cornish  $\times$  Barred Rocks and Leghorns  $\times$  White Rocks averaged heavier than Barred Rocks, Rhode Island Reds, Wyandottes, and White Leghorns, while Buff Orpingtons were as heavy as the heaviest crossbreeds. As roasters at the 4-lb. weight, the Leghorn  $\times$  White Rock cross reached this weight at 14 weeks, while the Rhode Island Reds and the Barred Rocks required 15 and 16 weeks, respectively, and Leghorns 22 weeks to reach this weight.

To 10 weeks of age the Wyandottes and Rhode Island Reds gained 35 and 34.3 g live weight for each 100 g of feed consumed. Barred Rocks ranked eighth with 28.6 g gain and Leghorns last with 28.2 g gain per 100 g of feed. As roasters the Barred Rocks gained 11.6 g per 100 g of feed consumed, with the Wyandotte  $\times$  Leghorn cross second, Rhode Island Reds third, and Leghorns last in this respect.

The crossbreeds excelled the pure breeds with the exception of the Wyandotte for percentage of edible flesh on the dressed carcass as broilers. The Leghorn  $\times$  Rhode Island Reds ranked highest and the Rhode Island Red  $\times$  Leghorn lowest in this respect. As roasters the Cornish ranked first, the Cornish  $\times$  Barred Rock second, and the Barred Rocks third. No definite relationship between body measurements and percentage of edible flesh on carcass was found. There was a general tendency with crossbreeds between light and general-purpose types to follow the body shape of the light type.

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# GENERAL

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## ***Report of Proceedings of the 5<sup>th</sup> Worlds Poultry Congress.*** Rome, Sept. 6th to 15th, 1933. 4 Volumes. Price 75 lire. Ministero dell'Agricoltura e delle Foreste.

*Vol. I.* 187 pages with many illustrations and coloured plates. Contains in French language:

Part I: General organisation, congress committees, regulations, list of members of the congress.

Part II: Report Inaugural Meeting, general reports, minutes of sessions of the congress, closing ceremony, general resolutions of congress.

Part III: Description of the exhibitions.

*Vol. II.* 674 pages. Contains: General reports, Reports of 1st and 2nd section in the different original languages.

*Vol. III.* 532 pages. Contains: Reports of 3rd, 4th, 5th and 6th section in the different original languages.

*Vol. IV.* 129 pages. Contains: abstracts in English of the General Reports and of the Section Papers.

## ***Memories at Eventide.*** By Sir Edward Brown. Printed and published by John Dixon, Ltd., Stanley Street and Manchester Road, Burnley, Lancashire. Letter sent to the Members of the Worlds. Poultry Science Association.

Dear Member,

Rotterdam, July 1934.

The International Review of Poultry Science is the medium through which I publish information respecting new books on Poultry Husbandry. I now am making an exception in that it concerns an interesting and valuable work of great historical value.

Our Founder and Hon. Past President, Sir Edward Brown, LL. D., F.L.S., has written his reminiscences, and in that respect has contributed to Poultry Literature a most important book showing how step by step were overcome many difficulties and won for the Poultry Industry the position it now occupies, uniting those engaged in it of all nations for a common purpose. The enclosed Prospectus will indicate the wide scope of this work.

Sir Edward is fully familiar with the history of the Poultry Industry throughout the world. During more than sixty years he has been engaged in its promotion, nationally and internationally. His enquiries, extensive travels and constructive labours have brought him into contact with many people of all ranks and classes. He was the First President of our Association and held that position for nearly fifteen years. He is still one of the most active leaders in international work. To him we are indebted for the World's Poultry Congresses.

He has been thus able to write a standard work, one that has no

equal in world literature. I am confident that all our members will wish to have a copy in their libraries.

In securing a copy of this book which will be issued shortly we are honouring one of our greatest men. Therefore, I hope to receive from every Member the enclosed Order Form with the amount named, 6 s 6 d, bound in cloth, or 8 s 6 d in leather.

faithfully yours,

Dr. B. J. C. te Hennepe,

Editor: International Review of Poultry Science.

**Contents:**

Prologue. Chapter: I. Introduction. II. Early Years. III. At the Cross Roads. IV. The Newspaper Press. V. Ireland and Its Poultry Industry. VI. Results of the Irish Enquiry. VII. The Progressive 'Nineties. VIII. The Progressive 'Nineties (continued). IX. Further Stages in Education. X. The Beginnings of Organisation. XI. Russia. XII. Hungary and the Balkan States. XIII. Spain and Italy. XIV. Canada and the United States. XV. Other European Countries. XVI. International Organisation. XVII. The War Period. XVIII. National Unity. XIX. The World's Poultry Congresses. XX. Epilogue. Appendices.

***A Record of High Achievement. Sir Edward Brown's "Memories at Eventide".*** By S. H. Lewer, The Feathered World, Sept. 21, 1934.

Speaking on July 30, 1930, at the dinner given by this paper to the Overseas Delegates to the World's Poultry Congress to enable them to congratulate Sir Edward Brown upon the honour of Knighthood then recently conferred upon him, Mr. F. C. Elford, as representative of Canada, made this remark:—

"There was yet one task which they should lay upon Sir Edward's shoulders. They read his weekly articles in The Feathered World with keen interest, but they felt that a man, who like him had visited so many countries and met such remarkable people, must have the most interesting reminiscences to record. He begged Mr. and Mrs. Lewer to use their influence to have these recorded."

To-day that appeal has been answered, for under the singularly appropriate title of "Memories at Eventide", Sir Edward has written his own biography. Favoured as the writer of this review was by the book's perusal in manuscript, he welcomes its appearance to-day in print for an opportunity is thus given to the wide circle of Sir Edward's friends, here and abroad, to read what they must all agree is indeed a record of high achievement.

Readers will follow with the greatest interest the account of Sir Edward Brown's boyhood under those hard conditions of existence which characterised industrial life in the fifties and sixties of the last century. They will gather from that story, the source from which was drawn the grit and determination which enabled the author later to wage, what appeared to many of us looking on, an almost hopeless battle for recognition of the importance of poultry keeping as a national industry. How that victory was won and how Sir Edward Brown has been spared to see in vigorous old age the accomplishment of his life work is well told in these pages.

Much more of general interest lies within them, however, for it has been the author's good fortune, from 1869 onwards, to have visited all parts of Europe on more or less official missions, and, backed by his own

reputation and influential introductions, to have met some of the most prominent personalities of the United States, Canada and of practically all European countries. Of these Sir Edward's book abounds in interesting description, and there are not a few anecdotes which throw light upon phases of European history. A keen traveller from youth up, the author has cultivated a power of description which has been put to good purpose on his visits to Russia, France, Hungary and the Balkan States, Spain, Italy and other parts of Europe. On many of these Sir Edward published very complete reports as to their poultry progress which have been helpful to this country as well. Conditions in Canada and the United States are well described in the book for few people have travelled more widely or more frequently through those countries, among the poultry producers of which Sir Edward Brown's name is as well known as it is in this country.

Of the early days of the Fancy in this country, when Harrison Weir, Lewis Wright and Tegetmeier were leading personalities and names to conjure with, this book has much to interest. The gradual development of the utility side of poultry keeping, as opposed to purely exhibition, which was the author's first hobby, is also well told. The task of converting the countryside was an uphill one, both here and in Ireland, and of the latter country Sir Edward narrates many amusing experiences. The book continues with the story of how recognition was slowly secured, of disappointment after disappointment which might have well deterred one less determined to win through. Then, as the dawn seemed about to break, came the crisis of the Great War, the account of which and its bearing on the poultry industry is graphically told with some interesting personal experiences during the war period. Reconstruction followed, and with it the culmination of Sir Edward's hopes in the series of triennial World's Poultry Congresses from 1921 onwards, and the formation of the National Poultry Council and Parliament.

To those who, like the reviewer of these reminiscences, have been familiar with the larger part of the life history here so pleasantly recorded, Sir Edward's biography is deeply interesting. To others who have not had the like privilege of long friendship with its author, "Memories at Eventide" should, however, have an equal appeal, since it chronicles the life effort of the man who placed the poultry industry in its present position as, after dairying, the most important branch of agriculture in this country. To have done that, in spite of continuous opposition, is a record of achievement of which Sir Edward Brown may well feel proud, and we recommend the story of its accomplishment to all our readers.

"Memories at Eventide" is published at 6 s. 6 d. post free, bound in cloth, and also in a specially bound edition autographed by Sir Edward, price 8 s. 6 d., which can be obtained from the office of The Feathered World, 9, Arundel Street, London, W.C.2.

*The Small Poultry Book. Das kleine Geflügelbuch.* Dr. B. Grzimek. Editor: Grüne Post, Berlin, Price *RM* 1.80.

This booklet which is mostly intended for settlers, backyarders and farmers, contains, in the right choice, the most important points which the little man, who tries to keep poultry, has to know. All counsels given therein made the easier to understand by the addition of many prints. The author abstains from giving a choice of several methods, but gives short, and concise instructions, founded on practice of many years. Special consideration is given to the feeding by making use of the foodstuffs which come as offalls from the proper household. Also as

regards the utensils he is careful to recommend only those which are useful and cheap and which, if possible, can be made by the person herself.

Contents: 1. What does the German Poultry Husbandry signify. 2. Why do our chickens not lay. 3. What breeds are we to choose. 4. House and Runs. 5. How have I got to feed them? 6. Hatching. 7. The purchase of day-old chickens. 8. Marketing eggs and table poultry. 9. Geese. 10. Ducks. 11. Turkeys. 12. Guinea fowl. 13. Anatomy. 14. Diseases. 15. Egg- and poultry recipes.

## ANNUAL REPORTS

*Annual Reports Swiss Poultry Association. Jahresbericht 1932 des Schweizerischen Geflügelzuchtvereins.* E. Mosimann, President, Riehen, Basel.

The association embraces 500 branches with 10,000 members. A summary is given of the exhibitions, examinations of judges, sale of legbands, breeding stations. In total there are 69 breeding stations with 1470 animals.

In 1931 there were 282,615 Poultry keepers, of which about 68.6 % peasants. The poultry stock amounted to 4,844,909 chickens and 52,324 ducks and geese.

*Annual Report Belgian Poultry Breeders Association, 1933.* A. Keymeulen, Heide-Calmphout.

This report gives a summary of: the combating of the pullorum disease (72,975 chickens were examined in 1933). Tests of cockerels in different places. The national Laying competitions. (1° Roesselaere. Entered were 210 hens, average lay 192 eggs, death 12 %. 2° Ans. Entered were 200 hens, average lay 193 eggs, death 14 %.) Furthermore the addresses of the official breeding stations, the exams of judges; Poultry Standards; Report on the Worlds Poultry Congress in Rome, Figures about trade in eggs and Poultry.

*Scottish National Poultry Council Year Book, 1934.* Secretary, Mr. J. Alexander, Grangepeel, Busby, near Glasgow.

The Scottish National Poultry Council was founded in 1923 on the initiative of Dr. Crew, and is now firmly established as the central organisation of the poultry industry in Scotland. That it is a live institution is abundantly evident in the pages of the booklet before us, which is the first Year Book to be issued by the Council. Apart from a summary of the composition, objects, and activities of the Council it contains a series of technical articles dealing with pasture for poultry, control of insect pests, incubation, housing, and coccidiosis. It is prefaced by a foreword from the President, Mr. R. Scott Miller.

*Chanticleer Annual 1934.* Southern Counties Poultry Society Ltd. Ed.: E. H. Hudson, Chilworth, near Guildford.

Contents:

"Quo Vadis" by Sir E. Brown. "Fowl Paralysis", H. P. Hamilton. Poultry House Ventilation, I. W. Rhys. Common Sense Hints, H. R. Hunter. Culling, E. H. Hudson. The seven ages of the fowl, A. Kirsch.



Chanticleer index, Vol. VII. Who's who in the S.C.P.S. Challenge Cups. Southern Laying Test, Copper Rings. List of Members.

*University of Cambridge School of Agriculture, Memoir No.6.* The Librarian, School of Agriculture, University of Cambridge, Cambridge, England.

This Memoir, which is published under the general editorship of the Librarian of the School, represents an attempt to present as succinctly as possible the contributions made by members of the Staffs of the School of Agriculture and its Associated Institutes to the development and progress of Agricultural Science, and to indicate to research workers interested the Journals in which the full papers are presented. Each summary is compiled by the author of the paper and is presented, so far as the subject matter will allow, in a non-technical form in order to be of value to the general body of farmers interested in the more recent developments of agricultural scientific research in general and of the activities of this Department in particular.

Requests for further information or criticism arising out of the summaries should be referred to the individual author concerned, criticisms and suggestions for the improvement of the Memoir itself should be addressed to the Librarian of the School.

*Progress Report of instructional and experimental work.*  
The National Institute of Poultry Husbandry. Newport, Shropshire, England, Bull. No.9, September 1933.

The object of this book is to give information on the instructional and experimental work of the Institute.

Contents: Part I. The Institute. The National Poultry Institute Advisory Committees, Staff, The National Poultry Institute Scheme, The National Institute of Poultry Husbandry, Harper Adams Agricultural College, College Laying Tests, Admission of Students, Fees, Scholarships and Medals.

Part II. Instructional Work. What Poultry Education means, Successes, Courses of Instruction, Details of Curricula.

Part III. Experimental Work. General observations on Poultry Livestock, Management and Plant, Experimental Work, Publications during 1931 and 1932.

*The National Poultry Institute Scheme.* The Poultry Record, May 1934.

The National Poultry Institute Scheme was established in 1921 through funds provided jointly by the Development Fund and the poultry industry, the contributions of the latter being secured through the National Poultry Council. The scheme is organised in six sections as follows:—

1. The National Institute of Poultry Husbandry at Newport, Shropshire, is the largest section of the scheme, and is devoted more particularly on the one hand to the development of specialised courses of instruction in poultry, waterfowl and rabbits, and on the other hand to the investigation under practical conditions of problems and new ideas arising in connection with Poultry Husbandry.

2. The Nutrition Research Section, at the Animal Nutrition Research Institute of the University of Cambridge, deals with fundamental

scientific research into problems of poultry feeding, and is under the direction of Capt. E. T. Halnan, M. A.

3. The Breeding Research Section at the University of Cambridge, under the personal guidance of Professor R. C. Punnett and Mr. M. S. Pease, is carrying out fundamental research in poultry and rabbit breeding.

4. The Poultry Disease Research Section at the Veterinary Laboratory of the Ministry of Agriculture, New Haw, Weybridge, deals with fundamental research in the diseases of poultry and rabbits, under the direction of Mr. N. Dobson, B.Sc., M.R.C.V.S.

5. The Northern Breeding Experimental Station, at the Cheshire School of Agriculture, Reaseheath, Nantwich, is directed by the Northern Sub-Committee of the National Poultry Institute Advisory Committee, and is engaged in practical investigations into the methods of poultry breeding for egg production.

6. The Southern Table Poultry Experimental Station at the South-Eastern Agricultural College, Wye, Kent, is directed by the Southern Sub-Committee of the National Poultry Institute Advisory Committee, and is engaged in practical investigations into the methods of producing table poultry.

### *North Carolina Sta. Report, 1932.*

The poultry studies furnished evidence on the effect of animal protein level in developing mash on the growth and sexual maturity of Rhode Island Red pullets, and the effect of feeding of fermented mash on egg production, by C. O. Bollinger; capon production, by N. W. Williams and Bollinger; and vitamin D study of menhaden fish oil, by Halverson and R. S. Dearstyne.

### *Arizona Sta. Report, 1933.*

Poultry tests yielded information on protein supplements for chicks, the effect of inbreeding and outcrossing on egg production and vigor, the negative value of male birds from high-producing hens for increased egg production and of shade for poultry, the utilization of a local meat meal and manamar, a comparison of various mash feeds, growing poultry under confinement, using Arizona-grown grains for poultry production, battery brooding rations, hen batteries, forced molt, and housing poultry in Arizona.

### *Cornell Station Report, 1933.*

In poultry studies, results are noted on poultry house ventilation, by F. L. Fairbanks, H. E. Botsford, and J. H. Bruckner; relation of physical condition, age, and production of hens to fertility and hatchability of eggs, by G. O. Hall, J. E. Rice, and E. A. Wright; biological study of the problems of artificial incubation of birds' eggs, by A. L. Romanoff, R. A. Sullivan, and M. Afanasien; protein efficiency and vitamin G potency of common protein supplements used in poultry rations, by H. S. Wilgus, Jr., R. C. Ringrose, and L. C. Norris; the value of corn gluten meal for feeding poultry, by Norris and Ringrose; nutrition of pheasants, by Norris, Ringrose, and G. Bump; the calcium and phosphorus requirements of laying hens, by Norris, G. F. Heuser, Wilgus, and Ringrose; influence of the protein level on the growth of chickens and its relation to subsequent behavior, by Heuser and Norris; methods of feeding pullets for egg production, and feeding early-hatched pullets, both by Heuser and F. E. Andrews; and a method for drying egg white.

*Experiments with livestock at the South Dakota Station.*  
South Dakota Sta. Report, 1933.

In poultry work, information was obtained in studies in calcification, by K. W. Franke; and the effect of "alkalied" grain on growing chicks and poultry, feeding values of wheat and wheat by products, and comparisons of several lime supplements for laying hens, all by W. C. Tully.

*Experiments with livestock in Wyoming.* Wyoming Sta.  
Report, 1933.

The work with poultry resulted in information on the effect of rye and other grains upon egg production and quality, feeding chicks at high altitudes, the use of heavy straw insulation and all-night dim lights in housing laying hens, hatching chicks in incubators at a high altitude, crooked breastbones of turkeys, and rations for poultry at the Lyman and Torrington Substations.

*South Carolina St. Report, 1933.*

Studies with poultry included feeding experiments with laying hens, simple v. complex rations for starting chicks, artificial lights for layers, and poultry housing experiments, all by C. L. Morgan; vegetable proteins in laying and breeding rations, value of dried milk in a standard meat scrap laying mash, value of dried whey in a standard meat scrap mash, value of alfalfa leaf meal and green feed as supplements to the laying mash, value of ground oats to replace one half of the yellow corn of the laying mash, and complex v. simple laying mash.

*Investigations with livestock in Michigan.* G. A. Brown,  
E. L. Anthony, and C. G. Card, Michigan Sta. Rpt. 1933.

In poultry experiments results were obtained on the effect of artificial heat on egg production of pullets during the winter months, the value of barley as a substitute for corn in the ration of laying hens and baby chicks, and the effects of temperature on incidence of pullorum disease.

*Experiments with livestock in New Mexico.* New Mexico Sta.  
Rpt. 1933.

With poultry results were obtained in comparisons of gluten meal, cottonseed meal, meat and bone scrap, and alfalfa leaf meal.

*Forty-Third Annual Report. For the Fiscal Year Ended  
June 30, 1933.* State College of Washington, Agricultural  
Experiment Station, Pullman, Washington, Bulletin  
No. 291, January 1934.

In poultry studies, information was obtained on the nature of watery whites in eggs, by J. L. St. John and A. B. Caster; herring meal as a protein supplement, by St. John and O. Johnson; and composition of eggshells from rachitic and normal birds, by St. John, R. H. Johnson, and A. Brunstad.

*Experiments with livestock in Indiana.* Indiana Sta. Rpt.  
1933.

The poultry tests brought results on poultry house ventilation, soybean oil meal in rations for chicks, wheat and oats as substitutes for

bran and middlings in chick rations, the relative value of dried milk and dried whey, alfalfa leaf meal in rations for chicks, inheritance of rate of growth, dressing percentages of turkeys, soybean oil meal in young turkey rations, young and old turkeys as breeders, and electric brooding at the Moses Fell Annex Farm.

*Investigations with livestock in Kentucky.* Kentucky Sta. Rpt. 1932, pt. 1, pp. 19, 20, 27-32.

In poultry studies information was obtained on the development of the turkey embryo, the iron and copper content of egg yolk, vitamin D supplements for laying hens, confinement v. colony brooding, selective flock breeding, effects of outcrossing on egg production, and method of feeding grain to laying pullets.

*Experiments with livestock in Missouri.* Missouri Sta. Bul. 328, 1933.

Experiments with poultry yielded data on soluble vitamin supplements for the chick, by Hogan and R.V. Boucher; normal growth of White Leghorn, Rhode Island Red, and White Plymouth Rock pullets, artificial lights and winter egg production, and meat scrap and milk in rations for baby chicks, by H. L. Kempster and E. M. Funk; the relation of date of sexual maturity to egg production, feed purchasing power of eggs laid by a hen, and time of hatching in relation to egg production, by Kempster; commercial fattening of poultry, by Kempster, Funk, and C. G. Bryan; influence of position in the egg cycle on size of eggs, the relation of egg production to hatchability, and effect of breed and age upon hatchability of hens' eggs, by Funk.

Information was also obtained in a study of growth of draft colts on liberal and restricted grain feeding, by Trowbridge, D. W. Chittenden, and S. Brody.

*Livestock investigations in Texas.* Texas Sta. Rpt. 1932.

With poultry information was obtained in studies on the value of dried milk products for laying hens and effects of feed on leg disorders in chickens, by R. M. Sherwood and J. R. Couch; inheritance of egg production and effect of cottonseed meal on storage quality of eggs, by Sherwood; and effects of irradiations on the domestic fowl, by W. R. Horlacher and Sherwood.

Other experiments on which data are reported consisted of studies on variations in the vitamin A content of various foods and feeds, by G. S. Fraps and R. Treicher.

*The significance of the Poultry Husbandry in Switzerland.*  
*Die volkswirtschaftliche Bedeutung der schweizerischen Nutzgeflügelzucht.* Schweizerischer Geflügelzuchtverein, President E. Mosimann-Riehen, Basel.

Illustrated booklet regarding the significance of poultry husbandry in Switzerland, as well as practical tips for poultry breeders.

*The French Poultry Industry.* Journal of the Department of Agriculture, Vol. 32, p. 392. *Dublin.*

The present state of the poultry industry in France was the subject of a paper read at a recent agricultural congress in Paris. The writer,

Mr. Dupuis, stated that, whilst poultry production had been placed on an industrial basis in certain countries, in France it still remained merely a branch of ordinary farm activity. The fowl-run was still the domain of the farmer's wife.

Mr. Dupuis did not urge that the modern industrial methods favoured in other countries should be introduced into France, but he would like to see poultry-keeping in that country improved and developed, not in order to achieve an enormous over-production, but in order to compete successfully against foreign rivals and to regain the place which France used to hold both on the home and the foreign markets. To do this, the cost of production would have to be reduced, and the quality of products improved. Present breeding-methods should be retained, but methods of production and marketing should be improved and extended, according to the needs of the various districts.

The present practice is to buy live birds at country fairs and markets, and to forward them in motor lorries to the places where they are killed and dressed by experts, after which they are sent to the various centres of consumption, such as the Halles Centrales (Central Markets) at Paris.

The costs per kilo of poultry, from fair to central market, borne by the consignor are stated to be:—4.80 fr.

At the present rate of exchange, 4.80 fr. is equal approximately to 1 s. 1 d. In the case of chickens weighing  $1\frac{1}{2}$  kilos (about 3 lb.), the charges amount to 5.80 fr. or 1 s. 4 d. per kilo.

In the opinion of Mr. Dupuis, the consumption of poultry will increase when the retail selling price is brought down to a figure which would bear a more equitable proportion to the wholesale price. The consumer too needs to be educated. The poultry trade being seasonal, he would have to be taught to profit by the period of heavy production when birds are cheap. The public must be shown that merely to eat a thing because it is scarce and dear is pure snobbery, and that cheapness does not necessarily detract from quality. Propaganda in this sense should be undertaken by the Government and the Press. Notices should be issued informing buyers that such and such an article can now be obtained cheaply because the season is at its height.

In Paris, consumption might be increased if the city dues (octroi) were abolished in the case of poultry. It is, says Mr. Dupuis, anti-economic to impose heavy fixed duties on commodities which, like chickens, are seasonal and are liable to very wide fluctuations in price.

TOME VII.

1934.

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U. S. Department of Agriculture

# INTERNATIONAL REVIEW OF POULTRY SCIENCE

OFFICIAL ORGAN OF THE  
WORLD'S POULTRY  
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SIXTH WORLD'S  
POULTRY CONGRESS  
AND  
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Dr. B. J. C. TE HENNEPE  
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 THE CANADIAN POULTRY REVIEW, 184, Adelaide Str., W., Toronto.  
 SCIENTIFIC AGRICULTURE, Can. Society of Technical Agriculturists, 306 Victoria Building, Ottawa.
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 SBORNIK CESKOSLOVENSKE AKADEMIE ZEMEDEL'SKE, The House of Agrarian Culture, Zemedelska 3, Brno.  
 VESTNIK CESKOSLOVENSKE AKADEMIE ZEMEDEL'SKE, Dr. Eduard Reich, Prague. Slezska 7, Prague XII.
- ENGLAND.** CHANTICLEER, Chilworth, near Guildford, [Surrey, EGGS, Rudgwick, Sussex.  
 THE FEATHERED WORLD, 9, Arundel Street, Strand, London, W.C. 2.  
 HARPER ADAMS POULTRY JOURNAL, Newport.  
 THE JOURNAL OF THE MINISTRY OF AGRICULTURE, 10, Whitehall Place, London.  
 LANCASHIRE UTILITY POULTRY SOCIETY'S REPORT, 22 Chapel Walks, Preston, Lancashire.  
 MEMOIRS UNIVERSITY OF CAMBRIDGE, Department of Agriculture, Cambridge.  
 NATIONAL POULTRY JOURNAL, Milford, Surrey.

POULTRY WORLD, 4, Carmelite Street,  
London, E.C. 4.

UTILITY DUCK CLUB MONTHLY NOTES,  
St. Antony's, Swanley, Kent.

POULTRY RECORD, Official Organ of the  
Nat. Utility Poultry Society, 53, Victoria Street,  
London, S.W. 1.

THE VETERINARY BULLETIN, Veterinary  
Laboratory, Ministry of Agriculture and  
Fisheries, Weybridge, Surrey.

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# BREEDING

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*Sexing day-old Chicks. A Treatise on sex Detection in Pure and Cross Bred Chicks.* With 16 pages of photos and many drawings. W.P. Blount, Published by Poultry World Ltd. Dorset House, Stamford street, London, S.E.1, 1934.

This booklet describes how sexing of chicks at birth can be applied by the ordinary poultry man. There seems no adequate reason why the method should not be taught in Agricultural and Poultry Colleges, for unquestionably the subject is one of great practical importance, and one which has come to stay. Similarly, with suitable coaching and experience, it should not be long before English experts are capable of being attached to hatcheries.

Author has experience of men approaching 60 years of age learning how to sex chicks with, an accuracy of 75 percent after only 4 hours tuition.

Contents: Foreword, Introduction. The sexual structure of chicks. Sex determination at Birth. Percentage types of genital eminences. Are the chicks harmed. Useful aids to learning.

*Chick Sexing.* M. A. Jull, United States Department of Agriculture. Bureau of Animal Industry, Washington. D. C. Jan. 11, 1934. New England Poultryman, Febr. 15, 1934.

In view of the information at hand, we are of the opinion that it would not be advisable to attempt to organise any schools for the purpose of giving instruction in this work; and even if it were advisable, we do not have any funds. Also, the demand for this work appears to be limited and there would be no need for importing twenty Japanese experts even if none of our own people could be trained to do the work.

*U.S. Specialists Acquire Accuracy in Picking sexes of baby Chicks.* Cackle and Crow, April 15, 1934.

So-called chick sexing—picking out the pullets and cockerels in a group of newly hatched chicks—has recently been done with considerable accuracy by poultry specialists of the U.S. Department of Agriculture. The method, first developed by the Japanese, consists of observation of the size and shape of the genital eminence, variations being only slight between the sexes at this early age. After a study of the problem covering four months the Department specialists acquired an accuracy of more than 90 percent, checking the results by postmortem examination of the chicks. Accuracy of 70 percent was acquired quickly by those doing the work, but much practice was necessary to pass the 90 percent point.

A mimeographed pamphlet which gives the essential directions has been published by the Department. Copies may be obtained from the Bureau of Animal Industry, U. S. Department of Agriculture, Washington, D. C.

No attempt was made to sex the newly hatched chicks with commercial rapidity, as is done in Japan where professionally trained men sex upwards of 5,000 chicks a day for big hatcheries. The Japanese have specialized in this business and have found that a great deal of experience with thousands of chicks is necessary before one can be properly trained to sexchicks on a commercial basis.

However, the Department specialists have shown, according to a recent report by W. H. Burrows of the Bureau of Animal Industry, that chick sexing at hatching time by Americans is feasible. With sufficient training and experience the work can be done on a commercial basis, in the opinion of Department specialists. If an increased demand develops for day-old pullets there will be a demand for qualified chick sexers who can sex several thousand chicks daily.

### *Chick Sexing.* H. L. Shrader, Senior Extension Poultry Husbandman—U. S. Department of Agriculture. U. S. Egg and Poultry Magazine, Sept. 1934.

The International Baby Chick Association, the national organization for the hatchery industry, held probably its best annual convention July 30th to August 2nd inclusive, at Cleveland, Ohio. Over 2,900 delegates and guests registered during the convention. 70 of the largest manufacturers of equipment and supplies for hatcherymen had displays in the huge exhibit hall off the Cleveland Public Auditorium. There was a spirit of friendliness, pride in the industry and genuine interest in the other fellow's problems, not often observed at such a large convention representing as it did each and every state in the United States.

From an observer's viewpoint the three outstanding features of the convention were the interest in the new plan of determining the sex of day old chicks, the frank discussions relative to the Code for the hatchery industry, which has been in operation this year, and the adoption of the national plan for the improvement of the poultry stock of the country. This plan for poultry improvement as recommended to the Secretary of Agriculture we are printing in full beginning on page 28 of this magazine. There is briefly discussed the matter of the hatchery code in the Melting Pot. The chick sexing program which is taking the hatchery industry by storm can best be described by quoting the opening remarks of Mr. H. L. Shrader, Senior Extension Poultry Husbandman of the U. S. Department of Agriculture, who had charge of a school of chick sexing at this convention.

### *As I see sexing.* C. I. Bashore, Hatchery Tribune, Sept. 1934

Many private schools as well as the government's extension forces are teaching the art of chick sexing. What is the practical value of this new movement? How will it affect hatcherymen, large and small? Who is best qualified to answer these questions?

For a good many years C. I. Bashore has been recognized as a progressive hatcheryman, and, through his service to the I. B. C. A., as an outstanding leader in the hatchery industry. He has made a careful study of this new development in sexing, and his views are expressed here in an exclusive article for Hatchery Tribune readers. Readers who

wish to write on this subject are invited to do so. Let us have a free discussion.

*The art of Chick-sexing not Confined to Japs.* M. A. Jull,  
The Feathered World, Oct. 26, 1934.

[So much complexity has arisen as to whether or not the white races can become proficient in chick sexing that we made inquiry of the Senior Poultry Husbandman to the United States Department of Agriculture, and this is his interesting reply.—Ed.]

Madam,—In our letter to you of April 27 we stated that in so far as we were aware there were no specially trained chick sexers other than the Japanese. We are now able to say that several American citizens have become so proficient that they can sex chicks with approximately 97 percent accuracy at a relatively good rate. It is true, of course, that some of the Japanese can sex chicks at a relatively high rate of speed with 97 percent degree of accuracy. On the other hand, quite a number of our American citizens have made remarkable progress during the past summer, and we now have quite a number who can sex chicks with 95 percent accuracy and do it at a fair rate of speed. In addition to this, we have a larger number who can sex chicks with an accuracy of 90 percent.

*Sexing Pure-Bred Chicks. 75 percent Accuracy is easy.* The  
Editor Feathered World, May 18, 1934.

In our issues of October 6 and November 24 of last year, we published some details of a Japanese method of telling the sex of pure-bred chicks at a day old. Since then we have received a number of inquiries upon the subject, and the following information may be helpful. One hatchery in this country is already employing two Japanese experts and proposes to engage several more. In America, where one would have expected the system to have proved more popular than over here—since little use is made of excellent sex-linked breeds like the Light Sussex—no Westerner has yet succeeded in mastering the method.

Several United States poultrymen can do the work with considerable accuracy, but they lack the speed necessary for commercial success; and no expert has so far been turned out from a private school purposely established for training in sexing in the State of Washington. As we wrote previously, the method still remains the perquisite of the pertinacious Jap; but the following notes issued by the United States Department of Agriculture, and kindly supplied us by Dr. Morley A. Jull, Senior Poultry Husbandman, describe the whole process very clearly.

*Continued Research upon Variation and Heredity of some Characters in White Leghorns, Rhode Island Reds and Barnevelders.* J. Axelsson, Department of Animal Nutrition of the Agricultural College of Sweden, Upsala. Lantbruks-Högskolans Annaler, Vol. 1, pag. 69-207, Uppsala, 1934.

**Summary of the results in chapter I:**

In this chapter an investigation of variation and heredity of egg weight in the three breeds and their crosses has been carried out.

A. As to the variation of the egg weight the following results were obtained.

1. The egg weight in all the three breeds increased most rapidly in the first part of the pullet year, but more slowly in the second part of the same year. In the second laying year such an increase did not occur, and therefore in the winter-month of the first part of this year the maximum egg weight in the life-time of the hens was reached. These results agree with the results of earlier investigations in all essentials.

2. In the pullet year a decrease in egg weight occurred in February—March, and this decrease was followed by an increase in April, while in May—June a new decrease was proved. Then an increase of the egg weight followed up to October. In the second laying year a decrease of the egg weight appeared in November, and this decrease was followed by an increase in December—January, and then a new decrease followed in February—March. In the continuation of the second laying year the changes, stated in the first year, were repeated.

3. In 25 hens of White Leghorns the earliest maturing birds showed a somewhat lower egg weight than the latest maturing ones. With some disturbances the egg weight increased continually up to 16-17 months of age, and the maximum egg weight was obtained at 16-20 months of age. The egg weight in the hens, therefore, seems to be the result of the general vitality or of the general power of productivity of the bird, and is thus connected with age. The intensity of laying influenced the egg weight, and this, therefore, decreased when the intensity was high and vice versa. When the intensity of laying showed a minimum, the body weight showed a tendency to increase, and when the intensity showed a maximum, the body weight decreased somewhat, and therefore a period of laying strained the capacity of food-consumption and food-digestion too much to make it possible to prevent a decrease in egg weight.

4. In 14 F<sub>1</sub>-hens from the crosses between Rhode Island Reds and Barnevelders the increase in egg weight was the same as in the 25 hens mentioned above, and the maximum egg weight in their life-time was in this population also reached at 16-20 months of age. In this population the egg weight up to 16 months of age was lower in early than in late maturing birds, while at higher ages it was the same in the two groups, and therefore in this respect this population did not fully agree with the White Leghorn population. In this case also a high intensity of laying decreased the body weight, while in a period of low intensity of laying the body weight increased. Also in this population a high intensity of laying was connected with decreasing egg weight, while a low intensity was followed by increasing egg weight.

5. In both these populations the egg weight showed some variation, and therefore the weight-curves of the eggs showed several maxima and minima. These maximum- and minimum-values of the egg weight were connected with the season in both populations. Thus, the maximum-values appeared in April and in August of the first laying-year and in October—January as well as in April of the second laying year, while the minimum-values appeared in June and in September of the first laying year and in March of the second laying-year.

6. That the egg weight decreased after 20 months of age was indicated but not proved with satisfactory certainty in the investigated populations. However, this conclusion was verified by the results obtained from three hens which at 16-27 months of age laid somewhat larger eggs than at 28-39 months of age. Thus, all the facts point in the direction that egg weight is an expression for the general power of productivity in the fowl, and therefore at a high age the egg weight



decreases, since the general power of productivity decreases at the highest ages.

7. The low egg weight in March and June was, partly, caused by the season directly or by factors connected with it, since hens in continuous laying from the beginning of February to the end of April showed in March an average egg weight about 1 gr lower than the one expected, and at the same time the intensity of laying was lower than in February or April. Hens in continuous laying from April to August showed lower egg weight in June than in April and in August, but in this case the intensity of laying decreased at the end of the period, i. e. in August and not in June.

8. In White Leghorns the increase in egg weight in the first months of laying was more rapid than in the two other breeds, and this result agrees with the hypothesis that the egg weight is a result of the power of productivity in the birds, and therefore in early maturing birds and breeds the egg weight increases more rapidly in the first months of laying than in late maturing birds and breeds. From a physiological point of view, therefore, White Leghorns are sexually mature at a lower age than the other breeds.

9. The number of days for the laying of 10 eggs was lowest in the beginning, and highest at the end of a period of laying. Thus, the intensity of laying, measured by the number of eggs laid in a certain time, decreased during the whole period. On the other hand, when the produced egg weight in gr per day was used as a measure of the intensity of laying (rate of fecundity) this intensity increased in the first part and decreased in the latter part of the period, and in this respect the hypothesis of Pearl (1911) was true. The egg weight was somewhat higher in the middle and somewhat lower at the end of a period of laying. The intensity of laying was lower in the spring of the 2nd laying year than in the spring of the 1st year, but the egg weight was higher in the 2nd than in the 1st spring.

10. The connection between egg weight and position in relation to the preceding egg was not very well marked in this investigation.

11. The correlation between average weight of the 10 first-laid eggs and age at sexual maturity was positive as in earlier investigations and showed a high value ( $r = +0.517$ ), showing that the increase in egg weight is independent of laying or not-laying at that time. However, between the average weight of 10 eggs in April of the pullet year and age at sexual maturity no correlation was found ( $r = -0.0255$ ) and, therefore, only in the first months of laying the early maturing hens show smaller eggs than the late maturing ones. The connection between age at sexual maturity and egg size, proved in many investigations, is thus, only of a developmental-physiological nature and, therefore, it is not possible to discover any linkage between the genes for these two characters, and accordingly such an investigation as that of Hays cannot give any result. The correlation between average weight of the 10 first-laid eggs and of 10 eggs laid in April was relatively low ( $r = +0.564$ ), showing that the egg weight is modified by environmental factors in a relatively high degree. The correlation between average egg weight in the beginning of the laying and body weight at 6-8 months of age showed relatively high positive values ( $r = +0.449$  on an average), and at that age, thus, the body weight influenced the egg weight in a high degree, which might also be expected, since egg weight is closely connected with power of productivity, for which character the body weight at that period is determinative in a high degree. For the correlation between average weight of

10 eggs laid in April of the first laying year and body weight at the same age the coefficients were lower ( $r = +0.323$  on an average), showing that at a higher age the connection between body weight and egg weight was less close.

B. As to the heredity of the egg weight the following results were obtained.

12. For the first-laid 10 eggs the egg weight was lowest in White Leghorns and highest in Barnevelders. In  $F_1$  the egg weight was intermediate, but rather higher than lower than the average egg weight of the parental breeds. In  $F_2$  the egg weight was higher than the average of the parental breeds. These results are explained by the assumptions that large egg size was intermediate or incompletely dominant to small egg size and that outbreeding effect and inbreeding degeneration did not occur. All the factors influencing the egg weight were of an autosomal nature.

13. For 10 eggs per hen in April of the first pullet year the egg weight was lowest in White Leghorns and highest in Barnevelders, and, thus, the relation between the three breeds was the same as for the 10 first-laid eggs. However, the differences between the egg weights of the three breeds were much smaller in April than in the beginning of the laying, which was also to be expected. In this case a lower egg weight was incompletely dominant to a higher egg weight. Outbreeding effect or inbreeding degeneration did not occur in this case, either. In this case, too, all the factors influencing the egg weight were of an autosomal nature.

14. Thus, it was proved that the results of the two investigations were different as to the dominance in  $F_1$ , but this difference in results was, probably, caused by the fact that more characters influence the weight of the first-laid 10 eggs than the weight of the eggs laid in April. This fact was also confirmed by the coefficients of variation, which showed higher values in the former than in the latter case.

15. In both investigations the coefficients of variation were greater in  $F_2$  than in  $F_1$ , and thus a segregation in  $F_2$  was proved.

16. In both cases the egg weight behaved as if dependent on multiple factors, all being of an autosomal nature.

17. It was proved that a positive correlation existed between the egg weights in dams and daughters, since in the breeds dams with high egg weight gave daughters with higher egg weight on an average than did dams with low egg weight. The breeds, therefore, from the genetic point of view were not uniform as to egg size, and thus the earlier results of Hays in Rhode Island Reds were confirmed in all the three breeds. A selection within the breeds according to egg weight will therefore be effective.

### Summary of chapter II:

In this chapter the egg production in the breeds and their crosses has been investigated. Among others the following results were obtained.

1. The first period of laying was longest in White Leghorns and shortest in Barnevelders, but the differences between the breeds were not fully significant. In some of the crosses,  $F_1$  showed a shorter first-period of laying than in the two parental breeds, and the whole  $F_1$  showed for this period an average length of only 91.2% of the average length of the parental breeds, while the corresponding % was 92.4 in  $F_2$ . Therefore, outbreeding effect or inbreeding degeneration could not be proved for this character. Since  $F_1$  (White Legh. ♀ × Rh. Isl. Red ♂) showed a shorter first-period of laying than  $F_1$  in the reciprocal cross, complement-

ary factors for short first-period of laying were supposed, and of these the one (or the ones) in Rh. Isl. Reds was sex-linked and the other (or the others) autosomal. This result recalls to mind the result from investigations of broodiness, and since all the  $F_1$  hens in the cross in question went broody several times in their pullet year, it was supposed that the same factors caused the short first-period of laying and the broodiness. In the crosses between White Leghorns and Barnevelders the tendency was the same as in those just mentioned, but the tendency was not so well marked in this case. In the crosses between Rhode Island Reds and Barnevelders, too,  $F_1$  showed a shorter first-period of laying than the parental breeds. Thus, all the facts point in the direction that complementary factors cause the first period of laying to be of short duration, and that this short period is connected with broodiness. These factors are dominant to the factors for a long first period of laying.

2. The produced egg weight in gr per day in the first period of laying was highest in Rhode Island Reds and lowest in White Leghorns, but the differences between the breeds were not significant. The  $F_1$  hens in the crosses between White Leghorns and Rhode Island Reds or Barnevelders showed a high intensity in the period, while the  $F_1$  hens from the crosses between Rhode Island Reds and Barnevelders showed a very low intensity in this period of laying. In  $F_2$  the produced egg weight in gr per day was higher than the average of the parental breeds, but this result was probably due to the higher age at sexual maturity in this generation. Outbreeding and inbreeding did not influence this character, either.

3. The length of the first period of laying was independent of age at sexual maturity, and this was also the case with the produced egg weight in gr per day. Thus, intensity of laying was not correlated with age at sexual maturity, and therefore the results in chapter I of this work were confirmed. This result also agrees with earlier results obtained by Hays and Sanborn. A positive correlation was proved between the length of the first period of laying and the produced egg weight in gr per day in the same period. This correlation was proved to be, partly, due to the fact that the egg size increases with age and, thus, with the length of the first period of laying, but partly it was due to the proved positive correlation between the length of the period and the intensity of laying expressed as the average number of days per egg produced in the period. No differences between the breeds were stated as to the length of the first period of rest. The length of this period was uncorrelated with the length of the first as well as with the length of the second period of laying, and thus earlier results of Hays and Sanborn were confirmed.

The second period of laying was longest in Rhode Island Reds and shortest in Barnevelders, but the differences between the breeds were too small to be significant. The length of this second period of laying was positively correlated with the length of the first period of laying as well as with the produced egg weight in gr per day in the period. A relatively high positive correlation was proved between the produced egg weight in gr per day in the first and in the second period of laying.

4. The variation in laying in the pullet year, known from earlier investigations, was confirmed. The fact that White Leghorns show a well marked high laying-% in the spring, while in the autumn they show a low laying-%, was also confirmed. The total number of laid eggs per hen in the year was 167.6 (the corrected number was 175) in White Leghorns, 165.3 in Rhode Island Reds and 148.2 in Barnevelders. A relatively high positive correlation ( $r$  being  $+0.579 \pm 0.2216$ ) was proved

between the average length of the first period of laying and the total number of eggs in the pullet year in the different matings.

5. The frequency of broodiness was highest in Rhode Island Reds and lowest in White Leghorns. However, in  $F_1$  this frequency was higher than in the parental breeds, and therefore this character was supposed to be due to complementary factors, partly sex-linked, partly autosomal. Since broodiness influences fecundity, this character also may be due to these two kinds of factors.

*The Record Hen. Breeding and Improvement. Principles for Breeding of highly-productive Hens. Rekordhonen. Årsl- og Foredlingslaere. Prinsipper for Årl ar hoity-dende Hons.* 63 pages with 32 illustrations. I. Five, State Adviser for Smallholdings Industries.—Gröndal & Söns Forlag, Oslo, March 1934.

The purpose of this book has been to explain the various sides of the work of breeding and improvement, as well as to afford guidance as to the principles for rational quality-breeding as basis for the development of highly-productive flocks.

I. Reproduction: This section deals with the organs of reproduction, with mating, and fertilisation, and the development of the embryo.

II. On heredity: Inherited powers and qualities, reduction-division, sex-determination and sex-linked inheritance. Mendel's law, line-breeding.

III. Breeding and improvement: This section treats of the objects aimed at in improvement of breed, with discussion of the inheritance of bodily size, productive powers, size and shape of egg, composition of shell, breeding capacities and tendency to brood.

IV. Selection and identification: Including composition of breeding-stocks, control-hatching and keeping of pedigree register.

V. Technical matters: Including requirements to be satisfied by eggs used for hatching, principles for exercise of control on laying, and external conditions for brooding and hatching.

*Report of the Poultry Committee. Canadian Society of animal Production—Eastern Section.* Dr. F. N. Marcellus, W. A. Maw, E. D. Bonyman, Scientific Agriculture, Vol. 15, 1934, p. 181.

General survey of: Breeding, Egg Production, Purebred or Hybrid, Studies in Hatchability, Standard Disqualifications, Breeding in Relation to Market Poultry, Nutrition, Growth, Fattening, Marketing, Housing, Sanitation and Health, Disease Control, Parasite Control.

*Report of Committee on advanced Registration. Canadian Society of animal Production—Eastern Section.* Scientific Agriculture, Vol. 15, 1934, p. 195.

Recently the Dominion Poultry Board recommended that the desirable features of existing policies be developed into a broader, more comprehensive and more scientific programme to include: the widest possible sources for testing stock, recognition of merit on a generation basis, recognition only of sound pedigrees, inclusion of additional worth

while characters as basis of qualification, advanced recognition of established prepotency, and provision for the widest possible dissemination to the farms of Canada of the blood lines established.

This programme naturally divides itself into two parts:—

1. The standards of production or qualification.
2. The recognition of prepotency in males and females.

It has recently been shown that only when the seven nearest dams of both the sire and dam have laid 200 or more eggs averaging 2 oz. each, is there a significant correlation between the dams' production and that of the progeny. A study of pedigrees under present breeding policies showed that over 50 % of the birds for which pedigrees were available, were sound—200 eggs, 2 oz. average weight—for at least three generations, and further work is being done with a view to providing a sound foundation for progeny test work.

It is proposed to progeny-test qualified birds in order to segregate the truly prepotent, valuable breeding individuals. It is also proposed to make genetical studies of these results with a view to giving further direction in breeding and possible recognition of flocks which are found to have a high average of prepotency.

In such a plan the object would be not the creation of a few extremely high record individuals, valuable as they are, or even the development merely of high record families, but rather to breed individuals that will produce heavily in flock units with little culling and selection, and with their vitality, stamina and inherited production ability so definitely fixed in the entire strain that they will reproduce their kind in large number for commercial purposes.

*R.O.P. progeny testing.* C.W. Knox, Poultry Science, Vol.12, 1933, No. 6, pp. 349-351.

In this paper from the U.S.D.A. Bureau of Animal Industry the author discusses a modification of the present poultry Record of Performance work. The principle of this improved method is that of progeny testing. In order to complete this method two phases of testing would be necessary—(1) inspection and gathering of a random sample of eggs to be shipped to a central breeding station and (2) the raising of a flock of pullets at the central breeding station.

*Progeny testing in breeding for egg production.* M.A. Jull, Poultry Science, Vol. 13, 1934, No. 1, pp. 44-51.

The U.S.D.A. Bureau of Animal Industry found in a flock of 793 White Leghorn daughters representing the progeny of 19 selected sires and 135 selected dams that in some cases the average egg production of the daughters of different sires varied significantly, while between other sires there was no significant difference. A given sire mated to a given dam may produce good progeny, but the same sire mated to another dam may produce poor progeny. The same was true of the female matings. Even full sisters mated to the same sire may produce widely different results.

A dam's egg record could not be used as a criterion of her breeding potential, nor could the egg record of a sire's dam be used as an index of his breeding potential. The average egg production of a group of full sisters was not an index of the breeding potential of any individual in the group.

It was concluded that the significance of progeny testing in breeding for egg production is determined by the results secured from a given mating.

*Egg weight in the domestic fowl.* E.M.Funk and H.L. Kempster, Missouri Sta. Bul. 332, 1934, pp.15, figs.3.

The relation of the weights of the eggs produced in four successive years in the station flocks to various conditions of production is reported.

The heaviest eggs were produced in February and those of the smallest weight in July, irrespective of the season or of sexual maturity. Although the age of the pullets at sexual maturity definitely influenced the size of the first 10 eggs laid, it was not closely related to maximum and average egg weight. Body weight at first egg was also definitely related to the weight of the first 10 eggs laid. It was found that the first egg laid after a pause was slightly smaller than the last egg laid before the pause.

Eggs produced in the morning were definitely larger than those laid during the afternoon. In reference to regularity of production where clutches of eggs were laid successively it was usually found that the first egg in such clutches was the largest egg laid in that clutch, and the decrease in the weight of succeeding eggs was much greater in case the first egg was unusually large than if the first egg was small. Greater decreases in the weight of eggs within a clutch were shown in the spring than during the fall and winter seasons of production. The breeds employed were arranged in the following order as regards the average weight of the eggs, beginning with the largest: Rhode Island Red, Barred Rock, White Rock, Ancona, Wyandotte, and White Leghorn.

A correlation of  $0.288 \pm 0.06$  between the average egg weights of dams and the average egg weights of their daughters is taken to indicate the inheritance of egg weight.

*Some factors affecting egg size in the domestic fowl.* N.L. Bennion and D. C. Warren, Poultry Science, Vol.12, 1933, No. 6, pp. 362-367, fig. 1.

The Kansas Experiment Station studied the records of 125 White Leghorn and 50 Rhode Island Red birds for the years 1921-22.

With Leghorn pullets there were indications that there was a gradual decrease in size with each successive egg in the clutch. The longer the clutch the greater was the decrease from first to last egg, but the smaller was the decrease of each egg within the clutch. After a pause of 7 or more days in production the first egg of Rhode Island Reds showed a decrease of 4.1 g from eggs similarly situated before the pause. With Leghorns this decrease was 2.3 g. Normal size was recovered in the second or third egg after production was resumed. During the early production period of pullets when egg size was on the increase there was a smaller decrease of successive eggs in a clutch than was true when birds reached their maximum egg size. Small egg size was not associated with high annual production. The higher producing birds maintained a larger mean weekly egg size during the year.

*Methods of estimating the mean egg weight per bird for the first year production.* A.B. Godefrey, Poultry Science, Vol. 12, 1933, No. 6, pp. 368-372, fig. 1.

In this statistical study at the U.S.D.A. Animal Husbandry Experiment Farm, Beltsville, Md., the weights of all eggs laid by 69 White Leghorn pullets for one complete laying year and by 124 birds for 11 mo. were available. The egg production varied from 121 to 265 eggs, and the mean annual egg weight was  $55.1 \pm 0.24$  and  $55.6 \pm 0.2$  g, respectively.

The analyses led to the conclusion that an approximation of the mean annual egg weight could be detected at the beginning of the pullet laying year from a knowledge of the average weight of the first 10 eggs, the body weight at first egg, and the age at first egg. A reliable estimate of mean annual egg weight of all eggs could be determined by weighing the eggs laid by each bird the first 4 days of each month. However, a more reliable and a more readily obtained estimate of mean annual egg weight of all eggs for each bird could be had by computing the mean weight of the eggs laid by each bird on any specified day of the week throughout the first laying year.

*Initial egg weight as a basis of prediction of maximum egg size.* W. Wilson and D.C. Warren, Poultry Science, Vol. 13, 1934, No. 1, pp. 52-55.

The Kansas Experiment Station made a study of the relation of initial egg weight to adult egg weight in White Leghorn, Rhode Island Red, and Barred Plymouth Rock pullets.

It was found that the opportunity for a pullet to reach standard egg weight (56.7 g or 2 oz.) at maturity was determined to some extent by the month in which she started producing. The average egg weight of the three breeds differed, and this had a slight effect on the initial egg weight necessary to reach the standard. Only 12 pullets of the three breeds reached the standard when starting with an egg weight of less than 46 g in October, 50 g in November, and 52 g in December or later. It is suggested that it probably would be profitable to eliminate soon after laying started those pullets which started production in the above months with eggs weighing less than 46, 50, or 52 g, respectively.

*Research in Breeding at Cambridge.* Prof. R. C. Punnet, Eggs, July 4th, 1934.

In the duck experiments the present year's work has led to the isolation of the homozygous Dark Runner drake, and, provided that nothing untoward happens, it will be possible next year to establish the pure-breeding Dark Runner for sex-linkage purposes. Similar experiments are in progress for the formation of a breed of Dark Campbells, but in this instance the work, having been started later, is a year behind the work with the Runners.

Work on developing the new Cambar breed of poultry for which Mr. M. S. Pease is responsible has been continued. A number of hens have now been reared which lay large coloured eggs and have given satisfactory annual records of production. The matter of identifying the corresponding cocks or establishing one or more lines which will perpetuate these desirable qualities is now in hand. An exhibit of stuffed birds and chicks, showing the method of improving the Cambar was staged as part of the British Exhibit at Rome, and a report on the work was made to the Congress.

*The reaction of dominant white with yellow and black in the fowl.* C.H.Danforth, Jour. Heredity, Vol. 24, 1933, No.8, pp. 301-307, figs. 3.

A study of various matings of Buff Leghorns with Black Minorcas indicated the operation of a gene for dominant white which was not very effective in suppressing the yellow factor in the plumage of Buff Leghorn fowls. This cross produced two distinct types, one black with brown eye rings and a yellowish wash anteriorly, and the other white with black legs and a faint sooty cast anteriorly. Evidently in birds homozygous for yellow the white becomes hypostatic and fails to appear, although dominant white suppresses black completely.

It is suggested that age and sex differences in the amount of yellow exhibited by dominant white birds are due to endocrine differences.

*Inheritance of albinism in the domestic fowl.* D.C.Warren, Jour. Heredity, Vol. 24, 1933, No. 10, pp. 379-383, figs. 2.

The occurrence of pink-eyed chicks in a White Wyandotte flock is noted. One such male, raised to sexual maturity at the Kansas Experiment Station, was crossed with colored females. The F<sub>1</sub> females, back-crossed to their sire, produced 42 chicks with white plumage, of which 38 had pink eyes; and 46 with colored plumage and normal eyes.

The results of these matings, together with matings of F<sub>1</sub>s with two other pink-eyed white males, suggested that this condition was due to a factor for albinism and was thus a fourth factor for the production of white in fowls.

The possibility of the albino condition being due to a close linkage of a factor for recessive white and a factor for pink eye was suggested, but in 286 pink-eyed chicks produced all were white and no crossing over was observed.

Although the albinos had no pigment in the eye, they were able to deposit xanthophyll pigment in the egg yolk and in the legs.

Frequent reference is made to the poor visibility of the albino chicks.

*Improvements of the Station Single-Comb White Leghorn Flock.* A.E.Tomhave and C.W.Mumford, Agric. Exp. Station, Newark, Delaware, Bull. No.179, 1932.

Five pens of pedigree hens were used during the past breeding season. The cockerels for three pedigree pens were again selected upon the basis of certain characteristics exhibited by their full sisters during the fall and winter months of their pullet-year production. This was done to determine whether the performance of the sisters of the sire is any indication of what might be expected from the progeny of the sire. A proven cock from one of the highest producing Leghorn flocks in the State was used in another pedigree pen. The fifth pedigree pen was made up of hens 3 to 7 years of age. The purpose of this pen is to study the effect of the age of the hen upon the fertility and hatchability of the egg, and livability of the chick.

Progress is being made in compiling the data that have accumulated during the past few years. A summary of these data will be presented at a later date. The project will be continued.





Entrance-Hall to the rooms where the Congress 1936 will be held.  
Formerly the House of Parliament of Prussia (das Preussenhaus).

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P2

*Limited value of ancestors' egg production in poultry breeding.* M. A. Jull, Jour. Heredity, Vol. 25, 1934, No. 2, pp. 61-64.

In a study of the egg records of 701 daughters produced by 15 different Rhode Island Red sires and 121 dams at the U.S. Animal Husbandry Experiment Farm, Beltsville, Md., no significant relationship was found between the egg production of the dams and the mean egg production of their daughters, or between the daughters' production and the production of their paternal granddams or either of their paternal great-granddams. However, a significant relationship was shown between the egg production of the birds and their three nearest female ancestors on the sires' and dams' sides of the pedigree. The difference observed was  $2,096 \times$  the standard error, which, with the numbers involved, indicated a value for  $p$  of 0.047.

*The Study of First, Second and Third Year Production.* M. Wayne Miller and Gordon E. Bearse. Annual Report of the Western Washington Experiment Station for the fiscal year ending March 31, 1930. Pyallup, Washington, Bulletin No. 18, W. New Series, O. A. 1930.

It is generally conceded by commercial poultrymen that pullet flocks return more profit than one and two year old hen flocks. On the other hand it is well known that a hen will lay larger eggs than a pullet and the cost of producing a pullet is extremely high if her usefulness is over in one year. Because of this larger egg size and lessened depreciation, a hen need not lay as many eggs as a pullet in order to be just as profitable.

Selection methods at this time are based almost entirely on first year production, assuming that if a hen lays well her first year she will also lay well in her second year. First year production is often used as a guide for determining which hens will make profitable layers during their second year. It has been demonstrated that certain hens will lay well for several years; in fact in the present study three hens have laid over 1,000 eggs. One of these laid 1,096 eggs in six years, and two others laid 1,117 and 1,114 in five years. On the other hand, many birds which were high producers in their first year for some reason do not lay well in their second and third years of production.

This project was started to determine the cause of the great variation of second year production of high production pullets and to select toward high production over a period of years. This study is a long time project which should give valuable information to the poultry breeder and producer.

Procedure: Two strains of birds to be selected and known as high line and low line birds. Basis of selection of High Line:

- First year production over 250 eggs.
- Second year production over 200 eggs.
- Third year production over 175 eggs.

Basis of Selection of Low Line

- First year production over 250 eggs.
- Second year production under 170 eggs.
- Third year production under 150 eggs.

It is interesting to note that of the two group selected that the second year's production of high line was 212.5 and low line 152.0 and the third year production of high line was 190.5 and low line was 123.8.

***Rapidity of Increase in Pullet Egg Size.*** M. Wayne Miller and Gordon E. Bearse. Annual Report of the Western Washington Experiment Station for the fiscal year ending March 31, 1930. Pyallup, Washington, Bulletin No. 18, W. New Series.

A project was started in 1929 to determine whether the rate of increase in pullet egg size is an inherited characteristic or not and if it is inherited to determine the mode of inheritance and establish a strain of birds that will come into production with an egg only slightly below standard size, increase rapidly to standard size and then remain at that point throughout their lives. The reason for inaugurating a project of this type was that every poultryman is much dissatisfied in the fall when his pullet flock comes into lay because of their small egg size right at the time when egg prices are highest.

In order to improve pullet egg size, breeders and hatcheries are setting in their incubators the largest eggs they can get. In the course of time this practice is going to result in large egg size becoming established in some strains. This may be very desirable from the standpoint of eliminating the small pullet eggs during the fall and winter, but it will be undesirable in the spring and summer when the eggs from those same birds have increased to a size that can only be put in egg case fillers with difficulty and therefore are subject to checking in transit, handling and grading. The economic value of a strain of birds which this experiment undertakes to prove whether it is possible or impossible to develop, can readily be seen.

The birds available for this study were a flock of 209 Single Comb White Leghorn pullets hatched May 10, 1929. They were a heterogeneous group, the greater part of them coming from a flock mating of the Experiment Station strain. The first of these birds to reach maturity laid its first egg at 161 days and the average for the flock was 189 days. Each individual was weighed at first egg. The eggs from each bird were weighed every day in grams on a Fairbanks balance scale until February 15, 1930, when a Toledo oil balance scale, graduated in grams, was purchased and thereafter used. The weights were recorded on an individual record sheet. For every bird the eggs for each ten-day period have been averaged to date, and this will be continued for thirty-six ten-day periods from date of first egg.

A statistical study of this group of 209 individuals was made as a guide to selection. It was felt necessary to correlate the various factors that might directly or indirectly affect egg size and egg size increase to determine their bearing upon them. For example, if it were found that a high degree of relationship existed between the average egg weight for the first ninety days and winter rate or number of eggs laid in the first ninety days as indicated by the coefficient of correlation, then it would be necessary in selection to limit the variation in rate between individuals to a very narrow range in order that that factor might not affect the results.

A study of Table I reveals that--

1. Rate of production does not influence either average ninety day egg weight or egg size increase.

2. There is a tendency for the largest birds to have the highest first ten-day average egg weight.

3. There is some tendency for the later maturing individuals to have higher first ten-day average egg weight.

4. There is a slight tendency for the later maturing individuals to weigh less.

5. There is a decided tendency for the hens laying the small sized eggs during the first ten-day period to increase their egg size more rapidly than those laying large size eggs during that period.

The breeding pens for the first year were selected on an arbitrary standard, as the extent to which various factors influence increase had not been determined. Two contrasting group of birds were selected. One line was composed of individuals increasing in egg size rapidly and the other was made up of those increasing slowly. Chicks from both these lines were pedigreed during the spring of 1930 and progeny records are being kept.

It was felt that the study was handicapped this past year by the lack of a body-size increase index. The birds in the project this year will, therefore, be weighed at first egg and at 30, 60, and 90 days from date of first egg.

*A Study of Line-Breeding, In-Breeding, Out-Breeding, Cross-Breeding and the formation of a Family "Strain". For Increased Egg-Production or Improved Exhibition Qualities. Inbreeding and Intercrossing in Poultry. The Effects, on Various Characters, of Close Inbreeding and of Intercrossing Closely Inbred Lines of White Leghorns.* M. A. Jull, Bureau of Animal Industry, Department of Agriculture, Washington, D. C., U. S. A., Canadian Poultry Journal, September, 1934.

#### Conclusions :

A. Under such close inbreeding as brother  $\times$  sister matings for three years, the following more important results have been secured :

1. Fertility of eggs was not materially affected.

2. Hatchability of eggs decreased, the greatest relative decrease occurring in the first year of inbreeding.

3. Viability of chicks was not materially affected.

4. Age in days that laying commenced increased under inbreeding.

5. Rate of egg production, as determined by the number of eggs laid the first 50 days after laying commenced, decreased, for the most part.

6. Total first-year egg production decreased.

B. The intercrossing of the progeny of the third-year inbred pens gave the following results as compared with those secured from the third-year inbred matings :

1. Fertility, for the most part, decreased.

2. Hatchability increased.

3. Viability of chicks increased.

4. Age in days that laying commenced, for the most part, decreased.

5. Rate of egg production, for the most part, increased.

6. Total first-year egg production, for the most part, increased considerably.

*Genetic studies with poultry by the Massachusetts Station.*  
Massachusetts Sta. Bul. 305, 1934, p. 55.

Brief results are given on the development of nonbroody and intense broody lines in continuation of results reported, continued studies of the inheritance of Rhode Island Red color in the  $F_2$  and back-cross stock, studies on the genetic laws governing the results of inbreeding, studies of egg weight and shell character which have appeared in three domestic lines, and autosomal genetic factors for rate of feathering as contrasted to a sex-linked recessive factor for early feathering, all by F. A. Hays; and annual egg production, egg size, winter pause, and exhibition qualities in specially bred lines, by Hays and R. Sanborn.

*Breeding for egg production.* F. A. Hays and R. Sanborn,  
Massachusetts Sta. Bul. 307, 1934.

A description is given of the improvements which have been made by breeding in the station Rhode Island Red flock from 1916 to 1932, with special reference to such characters as rate of maturity, weight at first egg, winter pause, winter clutch size, percentage of broodiness and duration of broody periods, persistency, annual production, mortality, and hatchability.

*All night Lights versus no Lights on single comb White Leghorn pullets.* E. F. Thomas, N. R. Mehrhof and W. F. Ward, Leaders, West central Florida Station, Agric. Exp. Station, Gainesville, Florida, State Project No. 229.

S. C. White Leghorn pullets of the same breeding and age were divided into two groups of approximately equal physical condition and body weight. Ninety-seven pullets were placed in Pen 1, and 98 pullets in Pen 2. All birds were leg banded. They received the same feed and management, except that Pen 2 a 10 watt all-night light was furnished throughout the winter. This experiment is still in progress.

Detailed records have been kept on mortality, feed consumption, individual and total egg production, feed costs, and current market prices of eggs.

*Influence of continuous light on Leghorns.* R. Penquite and R. B. Thompson, Poultry Science, 12, 1933, No. 3, pp. 201-205, fig. 1.

At the Oklahoma Experiment Station yearling hens and pullets of the White Leghorn breed were exposed to continuous light during a study which lasted three years. The lights did not increase or decrease to a significant extent the total number of eggs laid. In all the lighted pens birds weighed more at the end of the experiment than at the beginning. The continuous light apparently had no deleterious effects upon the birds, and did not materially decrease the percentage of healthy chicks produced. More eggs were produced during the months of November, December, and January in the lighted pens than in the controls. The peak of production in the lighted pens was reached in November and December, while the controls reached their peak in March and April. Mortality in the lighted pens was 24, 23, and 14 percent, and in the controls 5, 34, and 24 percent, in the respective years.

*The Effects of Radiations on the Domestic Fowls.* Horlacher, Sherwood. 43rd Annual Report, College Station, Brazos County, Texas.

High frequency radiations such as X-rays and the gamma rays of radium are known definitely to produce mutations in several species of animals and plants. The object of this project is to determine whether or not these radiations will produce mutations in chickens, a vertebrate species, and to determine whether or not this technique can be used in poultry improvement. During the past year the work has been confined to a study of somatic mutations. Matings were made in such a way that chickens which were heterozygous for a known pair of genes affecting plumage color were produced. The matings made were barred B cock (barred Rock), with black b hens (black Andalusian), silver S cock (Columbian Rock) with gold s hens (brown Leghorn), and black i cock (black Andalusian) with dominant white I hens (white Leghorn). It was observed that in each of these crosses dominance was incomplete, the controls frequently showing "ticks", or small areas of the recessive color. The recessive areas were larger and more frequent in the rayed series than in the controls and furnish indications of the production of somatic mutations, although inconclusive. The best evidence secured is on one chicken from the barred-black series. All of the primary and secondary wing feathers on this chicken, with the exception of two primaries in each wing, are black. This chick also has a large area of black feathers on the left side of his head. Numerous physiological changes occurred in the X-rayed chickens resulting in the production of various teratological forms. The eggs were radiated prior to incubation.

*Does increased light absorption cause increased egg production in the fowl?* T. H. Bissonnette, Poultry Science, Vol. 12, 1933, No. 6, pp. 396-399.

In this article the author briefly discusses some of the experimental work on the effect of increased light absorption on some of the vital activities of animals. A list of references to work of this character that may be of interest to workers in poultry science is appended.

*Force-molting of hens and all-night lighting as factors in egg production.* D. F. King and G. A. Trollope, Alabama Sta. Circ. 64, 1934.

The results of two tests are briefly reported involving a comparison of force-molting and all-night lighting with no molting and no lights for hens.

The results showed that the force-molting hens had a lower mortality, produced more eggs, and gave a larger return above feed cost than the birds in the control pen in both years. Hatchability was slightly lower in the lighted pen each year. Directions are also given for the management of birds with this method of lighting.

*Importance of Range Rotation in Poultry Production.* West central Florida Station, Agric. Exp. Station, Gainesville, Florida, State Project No. 226.

Two lots of S. C. White Leghorn chicks of same breeding were used in a study of use of range in growing chicks. 225 chicks per pen were

placed in each of two portable brooder houses. One pen of chicks was placed on a "clean" range, and the other pen on a "contaminate" range.

All chicks were wing banded and 100 of them from each pen were also leg banded. Both pens received the same feed and management. Weekly records have been kept on total weight of all chicks, and individual weights of the leg banded chicks from each pen, in order to observe growth rates of cockerels and pullets.

Records have been kept weekly on feed consumption, mortality and feed costs.

### *Confinement of Laying Birds without Succulent Green Food.*

A. E. Tomhave and C. W. Mumford, Agric. Exp. Station, Newark, Delaware, Bull. No. 179, 1932.

Complete confinement of a pen of laying pullets did not decrease egg production as compared with a pen of pullets allowed free alfalfa range. The pullets in confinement required one pound less feed to produce a dozen of eggs than did the pullets allowed on range.

Eggs from the two pens of pullets when placed in cold storage showed no marked difference in the extent of deterioration during the cold-storage period. The yolks of the eggs from the birds on alfalfa range, however, were extremely dark at the time of storage. When removed from storage after 6 months the eggs from the alfalfa-range pen were dark enough to be objectionable. Based upon this study, it is shown that it is a questionable practice to place eggs in storage where the layers have been allowed free range on alfalfa forage.

### *Gas Metabolism in Battery Chicks.* A. K. Danilova, A. N. Postnikova, G. G. Karlsen, Transactions of the Poultry Research Institute of U.S.S.R. in Moscow, Vol. I, 1933, p. 42.

#### Summary :

The following results were obtained in the study of gas metabolism of Leghorn battery chicks at the age of 1, 10, 20, 30, 45 and 60 days at basal metabolism and at feeding:

1. The respiration Schteuber apparatus (close chamber) is quite suitable for experiments of a duration from 4 to 8 hours (depending on the number of chicks). The accuracy of the readings is satisfactory; the percentage of error for nitrogen varies in the limits from 0 to 0.95 percent.

2. By the basic metabolism RQ varies from 0.665 to 0.880 (see table II); the higher value of RQ being at the age of 60 days, and the lower—in one-day chicks. Maximum production of CO<sub>2</sub> (30.6 l) falls on the age of 20th days, the minimum (23.1 l)—on 45th days. The consumption of O<sub>2</sub> nearly coincides in the 10th and 20th day old chicks (39.9 and 40.6); the lower—(29.7 l) is in 60th day old chicks.

Heat production varies sharply with age: maximum heat production per kilo-day (191.0 cal.) being observed in 20 days old chicks and then it decreases towards the 60 days (144.8 cal.). Heat production per 1 sq. m. of area is at its minimum in chicks one day old and it gradually increases towards the 60 days.

3. During feeding the following values were obtained: the value of RQ is higher than by basic metabolism: in 20-60 day old chicks 0.94 and in 1-10 day old chicks—0.81-0.89. The maximum production of CO<sub>2</sub>

(57.5 l) and consumption of O<sub>2</sub> (61.7 l) falls on the age of 20 days, the lowest falls on the age of 1 day. Heat production per kilo-day amounts in 20 days to 312.6 calories, while in 45 days it comes to 239.6 calories. Heat production per 1 sq. meter of area increases towards the 60 days.

4. Heat production connected with feed consumption gives the greatest value in 20 and 30 days (121 and 127 calories), which is 63 and 82 percent in relation to the basic metabolism; in 1 day and 60 days age—34 and 45 percent.

5. By the decrease of temperature from 28° to 20, 8° the gas metabolism increases: for chicks in the age of 60 days the rate of consumption came up to O<sub>2</sub> on 15.5 percent, production of CO<sub>2</sub> on 11.3 percent and heat production on 13.9 percent.

At 20.8° C the heat production in connection with feed consumption increases on 21.07 percent.

*Data on Weight of Body Parts of Battery Chicks.* F. E. Koch and V. K. Dyman, Transactions of the Poultry Research Institute of U. S. S. R. in Moscow, Vol. II, 1934, p. 1.

**Summary :**

The study carried out shows that the Leghorn chicks have a tendency of a decrease in the rate of increase in weights of separate body parts in percentage to total body weight during the growth up to the age of 70 days. The amount of meat decidedly increases and comes to 40 percent of the live weight of the chick. The quantity of blood (up to 4.27) and feathers also increases 5.5 percent respectively. The weight of the head and feet (7.9 percent), of the giblets (8.98 percent) and of the rest of the bowels- (69.87 percent)—shows a tendency to decrease. The relative weight of bones has a tendency to increase to the age of 70 days (20.5 percent); however, according to Benjamin's data, this percent in the 6 months Leghorn chicks is approximately three times less (6.86 percent). At what age occurs the changing point and begins the fall in weight—it is unknown, as data for the period from 70 to 180 days are absent.

*Chicken battery comments.* D. C. Kennard and V. D. Chamberlin, Ohio Sta. Bimo. Bul. 167, 1934, pp. 53-58, figs. 2.

This paper contains additional results, developments, and experiences in battery tests for chickens. The following phases of this method of raising poultry are discussed: Individual laying batteries, the mite problem, watering devices, triplepurpose pen batteries, and battery brooding.

*Sex characters of battery brooder and colony-raised White Leghorns.* G. D. Buckner, W. M. Insko, Jr., and J. H. Martin, Poultry Science, Vol. 12, 1933, No. 6, pp. 392-396.

Continuing the studies on sunshine and battery brooder confinement, the Kentucky Experiment Station divided cockerels into three groups following the removal of the comb or comb and wattles of some birds at 4 weeks of age. At 6 weeks the first group was transferred from the battery brooder to a colony brooder with access to a grass yard. In the second group the birds were confined to the battery brooder for 24 weeks. The third group of birds, confined in battery brooders, received 2 hr. sunshine every sunny day.



The testes of cockerels raised where they had access to direct sunlight were larger than the testes of cockerels raised in battery brooders. The removal of the comb or comb and wattles also reduced the size of the testes. The combs of birds raised in battery brooders both with and without contact with sunlight were larger than those of birds raised in colony brooders. The wattles of birds raised in battery brooders with sunlight or in colony brooders were larger than those of birds raised under similar conditions but with their combs removed. The combs of birds raised out of contact with sunlight were abnormally large and decidedly lopped as compared with the small erect combs of birds receiving sunlight.

The results of a test with pullets, some of which had their combs removed at 4 weeks of age, showed that such an operation apparently had no effect on the size of the ovaries up to the fourteenth week. When growing pullets raised in indoor battery brooders were allowed 2 hr. of direct sunshine on each sunny day, they were more vigorous and healthier.

*Confinement versus range rearing of Chicks.* E. F. Thomas, N. R. Mehrhof and W. F. Ward, Leaders, West central Florida Station, Agric. Exp. Station, Gainesville, Florida, State Project No. 227.

The relative growth, feed consumption, and percentage mortality of baby chicks and growing fowls are being compared when brooded and reared under confinement, in contrast to those reared on "clean" range.

S. C. White Leghorns of the same breeding, were divided into three groups taking into consideration weight and thrift. In Pen 1, 258 chicks were placed. This group was raised in battery brooders. Two hundred and twenty-five chicks in Pen 2 were placed in a brooder house, the floor of which was covered with hardware cloth and which had a small wire sun parlor attached to the south. In Pen 3, 225 chicks were placed in a colony brooder house which was located on a "clean" range.

The feed and management practices, other than range, were kept uniform. Total and 100 individual weights of chicks were recorded weekly. Feed consumption, mortality, and feed costs have been kept.

*Effects of night Feeding with artificial Light on the Growth of Chicks.* A. M. Zaratan, Philippine Poultry Journal, Sept. 1934.

The object of the present experiment was to determine the value of artificial illumination as an aid in securing more rapid growth in brooding chicks. The experiment was conducted in the Department of Animal Husbandry, College of Agriculture, Los Baños, Laguna. It was started in March, 1927, and closed in July, 1928.

**Summary :**

1. By means of artificial illumination chicks may be forced to take more feed.
2. The difference in weight from those on normal feed that the lighted chicks showed as a result of feeding is not appreciably significant during the first seven weeks of the brooding period.
3. No appreciable influence of extra feeding was shown until after the chicks attained the age of seven weeks. This difference became markedly significant after that period and continued to be significant for at least five weeks thereafter, or until the experiments were concluded.

4. The beneficial influence of the artificial lighting used in this experiment was manifested in the rapid growth of the chicks.

5. The percentage of mortality during the brooding period in all lots was unusually high, but it is significantly higher in the normal lots than in the lots that were given artificial light. The highest percentage of mortality in both lots occurred during the first four weeks.

6. During the night feeding which was forced through the aid of artificial illumination the chicks consumed grain very largely.

7. The chicks under artificial illumination developed feathers earlier than those under the normal lot.

8. It was observed also that the chicks given artificial illumination were apparently more vigorous than those in the check lot.

*The Control of Cannibalism in Battery Brooders and Fattening Batteries.* J. S. Carver, Poultry Science, Vol. X, p. 275, 1931.

Cannibalism and feather picking in White Leghorn chicks closely confined in batteries or brooding rooms may be prevented by the use of natural ruby colored lights. Cannibalism and feather picking in broiler fattening batteries may be prevented by the use of natural ruby colored lights where the room is darkened and no other form of artificial light is used.

*The Control of Cannibalism in Chicks by the Use of Ruby-red Glass in Brooder Houses.* E. van Manen, Research Poultry Plant. Onderstepoort. The Journal of the South African Veterinary Medical Association, Vol. V, 1934, p. 245.

Cannibalism is a vice which is acquired through some form of mismanagement (overcrowding, absence of sufficient hopper space, too high a temperature, lack of ventilation.

For battery brooding especially, the most efficient control of cannibalism exists in the use of ruby-red window glass for lighting purposes. In this way the red light which reaches the chicks prevents them from distinguishing blood on any part of their bodies. A temporary substitute for ruby-red glass can be found in painting ordinary window glass with a preparation of eosin, shellac and alcohol.

Author has been making use of red light for battery brooding for the past two seasons and has found this system very effective in preventing cannibalism.

*Transmission of ultra-violet light through window glass.* A. R. Winter and F. L. Bishop, Poultry Science, 12, 1933, No. 1, pp. 9-16, fig. 1.

This study was undertaken to determine the transmission of biologically effective ultraviolet light through different thicknesses of Lustraglass, two different brands of ordinary window glass, and one thickness of quartzlite glass. The requirements of growing chicks for vitamin D as supplied by sunlight and a mercury quartz lamp and the biological transmission of glass as compared with energy transmission were also studied, using 58 lots of day-old Leghorn chicks as experimental animals.

The two brands of ordinary window glass, quartzlite glass, and double strength Lustraglass (0.124 in. thick) transmitted very little biologically effective ultraviolet light. Lustraglass of the following thicknesses, 0.124, 0.087, 0.074, 0.06, and 0.05 in. was 26, 39, 45, 49, and 60 percent, respectively, efficient in biological transmission.

Normal growth and bone development of chicks resulted from an average daily exposure of 16 minutes to midday clear or slightly cloudy November sunlight in the region of Columbus, Ohio. An exposure of 8 minutes produced nearly normal results. During February and March 25 minutes' exposure to sunlight, 40 percent of which came through dense clouds, produced normal results, and 12.5 minutes brought about nearly normal results. An average dose of 2.4  $\mu$ w.-hr. of sunlight of wave lengths below 3,130 Å was sufficient to prevent rickets and to produce normal growth. During December, the minimum period of such sunlight, the available microwatt hours per day were 16 times the amount required.

*The Rearing of Chickens.* R. T. Parkhurst, Ministry of Agriculture and Fisheries, Bulletin No. 54, London, 1933, Price 6 d.

**Contents:**

Introduction: The Importance of Sanitation. Artificial versus Natural Brooding.

Natural Brooding.

Artificial Brooding: Intensive versus Free Range Management. Housing the Brooder. Housing the Colony Brooder. Wire Floors. Sun Porches.

Brooding Equipment and Operation: Outdoor Brooders. Colony Brooders. The Coal Stove Hover. Blue-Flame Lamp or Paraffin-Burning Hovers. The Electric Hover. Multiple Unit Systems. The Hot Water System.

The Management of Chickens in Colony Hovers: Preparation of the Brooder. Starting the Chicks. Battery Brooders.

Feeding and Management of Chickens: Starting Rations. Hoppers and Hopper Space. Mixtures Recommended. Ingredients of the Rations.

Later Management of Chicks in Colony Brooders: Weaning the Chickens. Pullets and Breeding Cockerels on Range. Summer Range Shelters. Disposal of Surplus Cockerels.

Diseases.

*Rearing Chickens. Poultry Notes.* E. Hadlington, Department of Agriculture, Sydney, N. S. W., 1932.

**Contents:**

Factors in brooding. Operating the brooders. Stoke up early. Avoid crowding. Feeding experiments. Comments of results.

*Shall Chicks and Pullets be ranged or confined?* D. C. Kennard and V. D. Chamberlin, The Bimonthly Bulletin, Ohio Agric. Exp. Station, 1934, No. 168.

The points emphasized by the data as a whole are: First, that according to these tests, it would seem to be extremely hazardous to brood chicks and grow pullets in confinement or batteries if they are to be exposed later to disease or parasite contaminated soil or similar infections from other sources. Second, that if chicks or pullets are to be

exposed to contaminated soil or premises, the exposure should be as soon as possible after they are 2 weeks of age, so as to give them the opportunity to acquire resistance to the infections at an early age; or, to put it differently, if chicks are brooded and the pullets are grown in confinement, they should be carefully guarded against the hazards of contaminated soil and the like by continued confinement or be transferred to a range known to be free of disease contamination. Third, that range paralysis persisted much the same irrespective of the different managements tested. In fact, there was a slightly higher percentage of paralysis among the layers raised on fresh range and in confinement than those raised on contaminated soil, Table 9.

These 4 year's results and experiences under varying conditions have demonstrated that the behavior and performance of pullet layers are definitely influenced by their management as chicks and growing pullets. However, management in itself had its limitations and all the managements tested failed to prevent or control some of the most serious causes of mortality, such as paralysis and the cholera-like diseases. For their prevention and control, we believe that special breeding, selection, feeding, and management for the development of birds resistant or immune to such complications offer the best promise for the final solution of the problem.

### *Effect of x Rays upon the Development of sexual Characters.*

A. F. Rolf, C. H. Schröder and W. A. Higgins, Poultry Science, Vol. 13, 1934, p. 274.

#### Summary :

Roentgenographic exposure of six-weeks-old cockerels at the rate of 1,750, 2,200, and 2,700 r. u., as well as two exposures of 1,750 r. u. at intervals of ten days reduced the development of the testes and of comb and wattles.

The treated birds apparently lost their ability to crow, but otherwise showed the external characteristics of a "slip" rather than a true capon.

The results indicate that the x-ray exposure to which the birds were subjected in this test did not completely inhibit the production and action of the hormone responsible for the growth of comb and wattles.

The amount of exposure to roentgen rays, as used in this test, significantly reduced subsequent weight gains.

Lesser amounts of radiation but of a different quality may produce more satisfactory results. Investigations to that effect are planned.

### *A method of demonstration of a living bird's embryo.*

A. L. Romanoff, Poultry Science, Vol. 2, 1933, No. 6, pp. 388, 389, figs. 2.

In this article from the [New York] Cornell Experiment Station the author describes a convenient method of demonstrating a living bird's embryo. The advantages of this method are (1) the simultaneous observation of all stages of embryonic development and (2) the continuous observation of the successive stages of the growth and development of the same individuals.

### *Studies in embryonic mortality in the fowl.—V, Relationship between positions of the egg and frequencies of mal-*

*positions.* F. B. Hutt and A. M. Pilkey, Poultry Science, Vol. 13, 1934, No. 1, pp. 3-13.

Continuing these experiments, the Minnesota Experiment Station studied the frequency of five malpositions of late chick embryos in eggs incubated horizontally and in others incubated at the same time but with the large ends raised about 45° up to the eighteenth day.

In the horizontal position the frequency of malpositions was 10.1 percent of 5,030 embryos alive at 18 days, or 60.4 percent of those dying after that age. With the large end raised the frequency of malpositions was 10.7 percent in 3,040 embryos alive at 18 days, or 65.9 percent in those dying after that age. Embryonic mortality was practically the same in both lots after 18 days.

The frequency of the malposition "head between thighs" was twice as great in tilted as in horizontal eggs, and "beak over wing" was 25 percent higher in the tilted position. "Head in small end" was twice as high and "rotated from air cell" three times as high in the horizontal as in the tilted eggs. "Head left" was somewhat more common in tilted eggs, but not consistently so.

It is pointed out that if the good features of both positions for incubation could be combined, the total mortality during incubation would be reduced by approximately 6 to 8 percent. The possible modes of origin of these malpositions and means of lessening their frequency are discussed.

*Inheritance of abnormal anatomical condition in the tibial metatarsal joints.* P. J. Serfontein and L. F. Payne, Poultry Science, Vol. 13, 1934, No. 1, pp. 61-63.

In this paper from the Kansas Experiment Station evidence is presented which indicates that the condition known as slipped tendons may be inherited. During the experiment two matings of Rhode Island Reds were made. One pen consisted of one male and eight females which had never shown signs of slipped tendons. The other pen was made up of one male and seven females, all of which had shown this abnormality in an advanced degree between 3 and 8 weeks of age. Chicks hatched from these matings were handled together.

In the straight-leg mating the incidence of slipped tendons among the chicks of both sexes was  $18.6 \pm 2.6$  percent, while for the crooked-leg mating it was  $50 \pm 3.2$  percent. On this basis it seemed highly probable that the tendency toward crooked legs was inherited. The results did not show whether there was any real difference in the expression of this abnormality in the two sexes.

*Construction and Operation of Electric Brooders.* J. E. Dougherty and B. D. Moses, Agric. Exp. Station, Berkeley, California, Circ. 325, 1932.

#### Contents:

Introduction. Requirements. Non-glowing (black heat) types of brooders. Glowing (radiant) types of brooders. Brooder design and construction. Construction of brooder. Determining the heating specifications for an electric brooder. Operating an electric brooder. Brooding turkeys, ducks and game fows electrically. Safety precautions.

*Feather Development in Barred Plymouth Rock Chicks.*  
A. M. M. Gericke and C. S. Platt, Agric. Exp. Station,  
New Brunswick, New Jersey, Bull. 543, 1932.

**Summary and Observation:**

Barred Rock chicks reared in batteries were fed all-mash rations containing 10.42, 11.69, 13.99, and 15.4 percent of total protein respectively (37 birds in each lot).

Feather development by tracts was studied weekly during the first 8 weeks.

Feather development over the entire body of the birds showed a significant increase in direct relation to the amount of protein in the ration.

Feather development in each feather tract showed an increase in direct relation to the amount of protein in the ration.

The coefficient of correlation between body weight and feather development when the chicks were 8 weeks old was  $+ .8120 \pm .0109$ .

Feather picking was more pronounced in the low protein lots.

Feather picking was more pronounced in the males than in the females.

After a feather was picked out, there was no further development in the respective feather follicle until the next moulting period.

*Ducks and Geese.* J. K. Lipscomb and H. Howes, Ministry of  
Agriculture and Fisheries, London, Bulletin No. 70,  
1934, Price 1 s.

**Contents:**

Table Ducklings: Introduction. Systems of Production. Choice of Site. Housing. Water Supply. Capital Expenditure. Breeds. Handling. Breeding. Eggs for Hatching. Natural Incubation. Artificial Incubation. Natural Rearing. Artificial Rearing. Fattening. Killing. Plucking. Packing. Marketing. Feeding. By-products. Diseases.

Geese: Introduction. Housing. Water Supply. Breeds. Selection of Stock. Feeding and General Management. Natural Incubation. Artificial Incubation. Rearing. Feeding the Goslings. Fattening. Killing and Plucking. Preparation for Market. Marketing. Production of Eggs for Hatching and Stock Birds. By-products. Diseases.

*Turkeys.* T. D. Bell and V. K. Tallent, Ministry of Agriculture and Fisheries, London, Bulletin No. 67, 1934, Price 6 d.

**Contents:**

Varieties. Starting with Eggs. Starting with Breeding Stock. Natural Hatching. Artificial Incubation. Natural Rearing. Artificial Rearing. Turkeys on Range. Maintenance of Health. Conditioning for Market. Killing. Marketing. Diseases. Calendar of Operations. Intensive Turkey Rearing: Housing. Brooding. Feeding.

*Turkey production.* F. E. Mussehl, Nebraska Sta. Bul. 280, 1933.

This is a revision of and supersedes Circular 34.

# NUTRITION

## VITAMINS

### VITAMIN A

*The Vitamin A Content of certain Food Products.* Prof. K. Waltner, *Zeitschrift für Vitaminforschung*, Vol. 3, 1934, p.245.

A tabular collection of some food products according to their vitamin A content. Unities per gram.)

Liver oil of Hippoglossus	1000
cod liver oil . . . . .	50-1500
egg-yolk . . . . .	10-50
carots . . . . .	20-40
yellow maize-meal . . . .	5-10
milk . . . . .	0.5-2
spinache . . . . .	20-60

*Halibut Oils as Vitamin Source.* Industrial and Engineering Chemistry, Vol. 25, 1933, p. 879.

The Vitamin Institute at Oslo has made some preliminary feeding experiments and color tests with halibut liver oil, results of which are claimed to indicate a content of vitamin A, 50 to 100 times greater than that of the average cod liver oil, and of vitamin D, 6 to 10 times as great. Other Norwegian tests have given similar results. The tests have not been extensive enough to determine the average potency and possible variations caused by season, locality where fish is caught, and methods of preparation.

Norway has exported only small quantities of halibut livers, principally for experimental purposes. Most of the halibut fishing is far from coast, a greater part being in Greenland and Iceland waters, so that livers must be stored on ice or salted to keep them in fresh condition until they can be landed on shore. The demand for halibut livers has made itself apparent so recently that any comparative methods for storing the livers to maintain quality and potency of vitamin content have not been thoroughly tested.

### VITAMIN B and C

*New nutritional factors required by the chick.* J. A. Keenan, O. L. Kline, C. A. Elvehjem, E. B. Hart, and J. G. Halpin, *Jour. Biol. Chem.*, Vol. 103, 1933, No. 2, pp. 671-685, fig. 1.

The Wisconsin Experiment Station undertook a study to demonstrate that a synthetic diet containing ample amounts of vitamins A,

B<sub>1</sub>, B<sub>2</sub>, and D would not support normal development in young chicks until two additional factors, both present in liver, were supplied. It was also intended to prove that one of these factors was identical with vitamin B<sub>4</sub>.

A simplified diet of casein, dextrin, salt mixture, yeast, and cod-liver oil fed to day-old White Leghorn chicks failed to produce normal growth, and the chicks developed a typical paralysis at about 3 weeks of age. Adding 18 percent of vacuum-desiccated hog liver to the diet resulted in normal growth and freedom from paralysis. Even after ether extraction the liver retained its potency. This defatted liver substance contained two factors, one insoluble in water and necessary for normal growth and the other soluble in water and necessary for the prevention of paralysis. When autoclaved at its natural pH, the antiparalytic factor of the liver was destroyed but the growth factor was not affected. Evidence is presented to show that the antiparalytic factor was probably identical vitamin B<sub>4</sub>.

*A "scurvy-like" disease in chicks.* W.F.Holst and E.R. Halbrook, Science, Vol.77, 1933, No.1997, p.354.

In this paper from the California Experiment Station the authors describe a scurvy-like disease of baby chicks, the first symptoms of which appeared after about 3 weeks' feeding in battery brooders on a ration of fish meal, ground yellow corn, yeast, ground oyster shell, and sardine or cod-liver oil.

The symptoms were first nervousness and lameness, followed by bleeding from pin feathers on the neck, wings, or thighs. At about the same time blood clots appeared beneath the skin and in the muscles of the thigh, around the hock joint, and at the base of the wings. This was usually followed by frequent hemorrhages around the head, neck, back, ribs, breast, and keel, and in the abdomen and intestinal walls. Dark erosion spots were also found on the lining of the gizzard. Affected chicks often had brittle bones, the bone marrow was dry and colorless, and the blood showed an extremely low hemoglobin content.

Omitting the yeast caused the symptoms to be somewhat less severe, while substituting 10 percent of dried skim milk for the yeast and part of the fish meal resulted in practically normal chicks. Cabbage fed at the rate of 5 g per bird to affected individuals during the fifth and sixth weeks brought about a complete recovery. From these results it was concluded that growing chicks may suffer from scurvy. The authors further believed that chicks are either unable to synthesize vitamin C or under certain conditions cannot synthesize the vitamin in amounts sufficient for their requirements.

## VITAMIN D

*Sardine and Tuna Oils as Sources of Vitamin D.* R. W. Truesdail and H. J. Culbertson, Truesdail Laboratories, Inc., Los Angeles, Calif. Industrial and Engineering Chemistry Vol.25, 1933, p.563.

### Summary :

The antirachitic potency of four raw sardine oils, four refined tuna oils obtained from commercial lots, and one medicinal cod liver oil are quantitatively determined. Three samples of sardine oil are quite uniform in their vitamin D potency, although slightly inferior to cod liver oil.



One is the equal of the cod liver oil as a source of this factor. Two samples of tuna oil are slightly inferior to three samples of sardine oil, and two tuna oils are either equal or superior to the cod liver oil as a source of vitamin D.

The suggestion is made that, with improved refining practices, the edible tuna oil may find a place as a source of vitamin D in human therapeutics.

*Vitamins A and D in Tuna Meal.* R. W. Truesdail and L. Shahnian, Truesdail Laboratories, Inc., Los Angeles, Calif. Industrial and Engineering Chemistry, Vol. 25, 1933, p. 661.

**Summary :**

A representative sample of meal prepared chiefly from the dark meat of the tuna has been tested for its vitamin A and D content. A chemical analysis of this sample indicated the following composition: protein ( $N \times 5.25$ ), 62.09 percent; ash, 18.24 percent; moisture, 8.61 percent; fat (ether extract), 8.04 percent; free fatty acid, 0.97 percent; and crude fiber, 0.50 percent. The tuna meal proved to be a good source of vitamin A, containing more than 14 Sherman units per gram. It is an excellent source of vitamin D, assaying more than 62 units (A.D.M.A.) of this factor per gram.

It is suggested that canned tuna, which is the white tuna meal, may provide these two factors for the human dietary. The vitamin content of canned tuna should be investigated. Consideration should be given tuna meal as a source of vitamins A and D for animal and poultry rations.

*Sardine Oil as a Source of Vitamin D for Growing Chicks.* J. S. Carver in cooperation with the Division of Chemistry, Agric. Exp. Station, Pyallup, Washington, Bull. No. 275.

Biological tests were conducted to determine the vitamin D potency of sardine oil when used at different levels with the W.S.C. chick ration with various mineral levels. The chicks on each mineral level were fed levels of  $\frac{1}{8}$  percent sardine oil,  $\frac{1}{4}$  percent sardine oil, and  $\frac{1}{2}$  percent sardine oil added to the all-mash ration. Lots 1 to 4 inclusive had no mineral added to the basal ration. Lots 5 to 8 had  $1\frac{1}{2}$  percent bone meal and  $1\frac{1}{2}$  percent oyster shell flour added to the basal ration. Lots 9 to 12 had 1 percent oyster shell flour added to the basal ration. Lots 13 to 16 had 10 percent oyster shell flour and 3.39 percent bone meal added to the basal ration.

*The Vitamin D Requirements of Growing Chicks and Laying Hens.* J. S. Carver, D. Brazie and E. I. Robertson in cooperation with the Division of Chemistry, Agric. Exp. Station, Pyallup, Washington, Bull. No. 275.

This experiment involves 11 lots, each lot containing 200 White Leghorn chicks, and was started April 2, 1932. All these lots were fed on the same standard all-mash ration. Lots 1 to 6 inclusive were kept in confinement, with no exposure to sunlight and fed a biologically tested concentrated vitamin D supplement at levels of 0,  $\frac{1}{32}$ ,  $\frac{1}{16}$ ,  $\frac{1}{8}$ ,  $\frac{1}{4}$ , and  $\frac{1}{2}$  percent of the total ration. Lots 7 to 11 inclusive received the same



Entrance to the rooms where the Congress 1936 will be held.  
Formerly the House of Parliament of Prussia (das Preussenhaus).

treatment with access to wire screened sun porches throughout the day and received vitamin D supplement at levels of 0,  $\frac{1}{32}$ ,  $\frac{1}{16}$ ,  $\frac{1}{8}$ , and  $\frac{1}{4}$ , respectively. All of the cockerels were removed at four weeks and data gathered on pullets only, from then on.

At 24 weeks of age the number of birds in each pen was reduced, by careful selection, to 44.

From the end of the 24th week on, data are being collected on trapnest egg records, bird weight and physical condition, feed consumption, and mortality by four-week periods. Individual egg studies are being made one day each week as to egg weight, volume, shell texture as seen under the candle, interior quality as seen under the candle and also after the egg is broken, air dry weight of shell, and oven dry weight of shell.

At representative periods hatchability tests will be made on the eggs from all pens.

### *The vitamin D requirements of growing chicks and laying hens.* R. R. Murphy, J. E. Hunter, and H. C. Kandel, Pennsylvania Sta. Bul. 303, 1934.

The results of tests are reported in which from 0 to  $\frac{1}{2}$  percent of cod-liver oil was added to an all-mash ration for 2,000 Single Comb White Leghorn chicks raised to 24 weeks of age in confinement and for about 500 of the pullets the following year. In addition to the 8 lots in this group confined to battery brooders, there were 2 lots of birds on range designed to compare the value of no cod-liver oil or  $\frac{1}{8}$  percent as a supplement to the all-mash ration.

The group of birds receiving no cod-liver oil showed symptoms of rickets at the end of 3.5 weeks and was discontinued at the end of 16 weeks because of the extreme rachitic condition of the individuals. The group receiving  $\frac{1}{32}$  percent of cod-liver oil also developed external symptoms of rickets at about 7 weeks of age, but was continued throughout the experiment. The group receiving  $\frac{1}{16}$  percent of cod-liver oil showed a slight deviation from normal in the histological picture of the epiphysis of the tibia and a low blood calcium value at 8 and 16 weeks when examined, but its growth curve seemed approximately equivalent to the other lots receiving larger amounts of cod-liver oil throughout the 24-week period. Both lots on range developed normally.

Some birds were continued to 76 weeks of age during production on the same rations. Birds receiving  $\frac{3}{16}$  percent or less of cod-liver oil in the mash gave somewhat lower egg production than those receiving larger amounts of cod-liver oil. An allowance of  $\frac{1}{4}$  percent of cod-liver oil, supplying 270 international units of vitamin D per gram, is recommended for laying pullets confined without access to sunlight, to give satisfactory results in maintenance of body weight, egg production, egg size, quality of eggshell, and hatchability. No differences were observed between the groups receiving  $\frac{1}{8}$  percent of cod-liver oil and those receiving no cod-liver oil on the range.

The all-mash ration fed to the birds consisted of yellow corn, wheat bran, wheat middlings, alfalfa leaf meal, meat scrap, dried milk, ground oats, ground limestone, and salt.

### *The Vitamin D Requirements of Chickens.* J. S. Carver, E. I. Robertson, D. Brazie, R. H. Johnson, J. L. St. John,

Agric. Exp. Station, Pullman, Washington, Bulletin  
No. 299, July 1934.

**Summary :**

**Growth.** From one to 16 weeks, growing pullets in confinement without sunshine required a minimum of approximately 17 International (U.S.P.) units of vitamin D from this cod liver oil per 100 grams of the ration for satisfactory calcification and growth. From 16 to 24 weeks of age, growing pullets in confinement without sunshine required a minimum of approximately eight International (U.S.P.) units of vitamin D from this cod liver oil per 100 grams of the ration.

From six to 24 weeks, there was apparently a sufficient amount of ultra-violet light from sunshine to supply these pullets the necessary amount of vitamin D for satisfactory calcification and growth. Under the conditions of the experiment, it would appear that ultra-violet irradiation from sunshine would supply satisfactory calcification for the months of May to September.

When sufficient amounts of vitamin D from this cod liver oil were present in the ration, the addition of vitamin D from sunshine did not appear to increase or retard growth.

The calcification of the tibiae was practically completed at 16 weeks of age.

The crookedness of the keel bones of the pullets fed no vitamin D (Lot 1) was more pronounced at 24 weeks than at eight or 16 weeks of age. Insufficient amounts of vitamin D apparently caused an increase in the number and severity of crooked keel bones.

**Egg Production.** Laying pullets had the ability to store vitamin D during the growing period, which apparently was not exhausted until after three months of egg production.

The lack of sufficient amounts of vitamin D from either cod liver oil or ultra-violet irradiation from sunshine seriously retarded egg production.

When a sufficient supply of vitamin D from either cod liver oil or ultra-violet irradiation from sunshine was available, the eggs of the various lots were of average weight, but when an inadequate supply of vitamin D was supplied the average egg weight was materially reduced.

To obtain satisfactory egg production from hens in confinement without sunlight, 67 International (U.S.P.) units of vitamin D from this cod liver oil per 100 grams of the ration were required in this experiment.

The determination of the egg density and the percentage of water and ash in the shell indicated that, under confinement without sunshine, an average of 67 International (U.S.P.) units of vitamin D from this cod liver oil per 100 grams of the ration were necessary to secure satisfactory egg quality. The same data for Lots 7 to 11 supplied with ultra-violet irradiation from the sun did not show the necessity of any additional amounts of vitamin D from this cod liver oil to supplement that obtained from the sun in order to maintain satisfactory egg quality.

These egg studies indicate that when insufficient amounts of vitamin D were supplied from either source, lower egg production and smaller egg size were accompanied by inferior quality of shells.

**Hatchability.** Breeding hens kept in strict confinement without sunshine required 135 International (U.S.P.) units of vitamin D from the cod liver oil per 100 grams of feed to produce satisfactory results in hatchability.

When laying pullets had access to sunlight, it was necessary to

add 34 International (U.S.P.) units of vitamin D from this cod liver oil per 100 grams of the ration to supplement the limited amount of sunshine available from December 10 to March 4 to obtain satisfactory results in hatchability. For the remainder of the year it was not necessary to supply, under the conditions of this experiment, vitamin D from cod liver oil to secure satisfactory hatchability where the pullets had access to sunshine.

*Sunlight as an important Aid to the Action of Vitamins in the System.* N. K. Basu, Zeitschrift für Vitaminforschung, Vol. 3, 1934, p. 254.

Experiments with rats proved that the ultra-violet portion of the sunlight is necessary not only for the activation of provitamin D to the vitamin D stage, but also for the activation of provitamin A to vitamin A in the body.

*Absorption of Vitamin D through the Skin.* M. E. Fodor, Zeitschrift für Vitaminforschung, Vol. 3, 1934, p. 241.

As a results of these experiments on albinorats is found that irradiated ergosterol can be absorbed through the skin, but that ten times an amount given per os is necessary to cure the symptoms of the rickets by this means.

*Cod Liver Oil in the Winter Ration of Pullets. Results of a three-year Study of the Effects on Egg Production and the hatching Power of the Eggs laid.* A. W. Edson, Agric. Exp. Station, University of Minnesota, University Farm, St. Paul. Bull. 286, 1932.

**Summary :**

1. The results of the three seasons' work show that feeding cod liver oil during the winter months to pullets confined in the laying house will increase egg production.
2. The egg production will not only be increased, but the eggs will be produced at a lower cost when the hens are fed a mash containing cod liver oil.
3. Cod liver oil, when fed to pullets confined indoors, very substantially increases the hatching power of eggs.
4. Cod liver oil added to the mash at the rate of 2 percent seems to be the most economical amount of oil to feed when hatching power and egg production are both considered.

*Recent developments in pharmacopoeial vitamin standardization.* E. F. Cook, Amer. Jour. Pharm., 105, 1933, No. 12, pp. 583-587.

A brief history is given of the development of the U.S.P. standards for cod-liver oil with the relationship between various units which are in use for vitamins A and D. According to the author, "one U.S.P.  $\times$  Sherman [U.S.P., tenth edition] or A.D.M.A. [American Drug Manufacturers' Association] unit of vitamin A equals 1.4 international or new U.S.P. units. One Steenbock unit of vitamin D equals 2.7 international or new U.S.P. units. One international or U.S.P. unit of vitamin D equals 3.25 A.D.M.A. units."

*Sexual differences in calcification of chicks and the effect on assays.* C.H. Schroeder, Poultry Science, 12, 1933, No. 4, pp. 256-260, figs. 3.

Based on a study of thousands of X-ray photographs, the author has demonstrated a sex-specific difference in the calcification of homologous shaft bones of chicks. The proximal end of the metatarsi of cockerels showed but 81 percent of the calcification noted in female chicks when the assay was made roentgenographically. The tibiae of cockerels contained only 96.4 percent of the bone ash shown by females. The author believes that this sex difference is of sufficient magnitude to deserve consideration in the assay of bone calcification, especially when but small differences occur, when working with small populations, and when using the roentgenographic method.

## MINERALS

*Rickets in Chickens, with special Reference to its Nature and Pathogenesis.* J.P. McGowan and A.R.G. Emslie, Aberdeen, The Biochemical Journal, Vol. 28, 1934, p. 1503.

### Summary:

It is very unlikely, owing to the type of food usually given, that chickens will suffer from a deficiency of  $P_2O_5$  but almost certain that Ca will be lacking.

This latter deficiency is exaggerated and aggravated by the osteoporotic condition of the body of the chicken on hatching, a circumstance which necessitates a very active Ca metabolism to meet it. Vitamin D has only a very slight influence in compensating for this lack of Ca.

In the usual amended diet of chickens, large quantities of Ca, generally as  $CaCO_3$ , are incorporated but, owing to the alkalosis induced by such foods, the Ca is not absorbed and metabolised, and the condition of osteoporosis, already present, persists and is exaggerated.

It is doubtful whether, even if regard be had to the exact chemical combination of Ca given and the amount of it supplied, Ca in itself as such and without vitamin D could be administered so as to avoid this complication. This point can only be settled by further experimentation, which has already been commenced.

Administered in amounts larger than those associated with the appearance of osteoporosis, Ca, by interfering with the absorption and metabolism of P, produces rickets.

Vitamin D by its fundamental action, working along different lines in the two conditions just mentioned, prevents, on the one hand, the occurrence of osteoporosis, due to deficiency of available Ca, and, on the other, rickets, due to P deficiency.

An important precursor of the condition, perosis, is the feeding of large quantities of CaO and  $P_2O_5$  in chemical union with one another.

*A statistical analysis of some experiments on slipped tendon.* T. T. Milby, Poultry Science, Vol. 12, 1933, No. 6, pp. 352-355.

In this report from the Iowa Experiment Station the author has made a statistical analysis of the literature in this field to determine

whether or not there is any constant relationship between certain constituents of the ration and the incidence of slipped tendon.

There was a highly significant positive correlation, 0.6303, between the amount of phosphorus in the ration and the percentage of slipped tendon. The multiple correlation was not sufficiently larger than the simple correlation between phosphorus and slipped tendon to make its use advisable in place of the latter. The phosphorus content of the ration gave practically as good an estimate of the amount of slipped tendon as did protein, ash, calcium, and phosphorus combined. Taking into account the variation in percentage of slipped tendon due to correlation lowered the standard deviation of the percentage of slipped tendon 29.06, to the standard error of estimate, 22.74, a reduction of 21.8 percent. On this basis there was no justification for the conclusion that phosphorus is the principal cause of slipped tendon, but the results indicate that high percentages of slipped tendon are associated with high phosphorus rations.

*Mineral content of tibiae from chicks with slipped tendon.*

A. D. Holmes, M. G. Pigott, and W. B. Moore, Poultry Science, Vol. 12, 1933, No. 6, pp. 356-361.

The authors fed seven starting and growing mashers similar to those used on commercial poultry farms. The ash content of the mashers varied from 7 to 9.2 percent, the calcium from 1.7 to 2.6 percent, and the phosphorus content from 0.8 to 1.1 percent. At 3, 6, and 9 weeks of age chicks showing slipped tendons and normal chicks were removed for bone analyses.

There was no significant difference between the size and mineral content of tibias from the chicks with slipped tendons and those from the normal chicks.

*Factors affecting the determination of the ash content of the tibiae of chicks.* R. M. Bethke and P. R. Record, Poultry Science, Vol. 13, 1934, No. 1, pp. 29-33.

In order to ascertain whether the method of examination or the solvent used was a factor determining variations in ash values, the Ohio Experiment Station crushed and extracted with hot 95 percent ethyl alcohol for 60 hr. the tibias from several lots of 6-week-old White Leghorn chicks that had been fed a rachitic ration supplemented with different amounts of vitamin D.

It was found that bones could be as effectively extracted with the above-described alcohol procedure as with alcohol followed by ether. Removing the proximal cartilage caused a significant increase in the ash percentage of the tibias. The moisture taken up by the extracted bone also significantly affected the ash percentage.

The advisability for standardizing the method of determining the ash, the procedure of preparing bones for ashing, and expressing the percentage of ash on a moisture-free and fat-free basis are discussed.

*Importance of the Mineral Components of supplemental Feeds in the fattening of Poultry.* A. S. Solun and

A. G. Troitskaya, Transactions of the Poultry Research  
Institute of U.S.S.R. in Moscow, Vol. II, 1934, p. 18.

**Summary :**

Analysis of data on the replacement of eggs and blood meal by other animal feed with the addition thereto of cabbage for fowls of a various condition, before being placed in the crates has shown :

1. A different physiological influence of feeds in relation both to protein as well as to the mineral components. The decreasing series of tested feeds is as follows :

a) In relation to the biological value of the protein : egg—milk—worm—cracklings—blood meal—tankage.

b) In relation to mineral components : milk—cabbage—tankage—worm—blood meal.

2. A different influence of the tested variants of feeding during the fattening of fowls of different condition which has shown a greater demand for biological value of protein of the fowls poorly fed before fattening, whereas the well-fed fowls showed a greater demand for the basic mineral components of the ration.

In our subsequent studies it is planned a more detailed examination of the question herein approached.

*On the Problem of acid-basic Balance in Poultry fattening.*

A. S. Solun and M. J. Schuster, Transactions of the  
Poultry Research Institute of U.S.S.R. in Moscow,  
Vol. II, 1934, p. 31.

**Summary :**

1. The dynamics of sugar concentration in the blood does not allow to form any judgement on the course of the fattening process.

2. Addition of calcium salts of the organic acids to the feed (grain and animal products) decreases the percent of ammonia in the excreta and of chlor in the erythrocytes.

3. In the same conditions the addition to the ration of calcium salts of organic acids has a positive influence on the maintenance of the fowls appetite during the whole period of fattening ; in connection with this the quantitative and qualitative results of the fattening (weight increment, amount and density of the fat) increase greatly.

4. The positive results of fattening by addition of calcium salts of organic acids to the ration, which coincide with the lowest indexes of ammonia in the excreta and of chlor in the erythrocytes indicate the fact, that one of the fundamental factors regulating the fowls appetite and the results of fattening is the maintenance of the organism's acid-basic state.

5. Calculation of the correlation of acid and alkaline valencies of feeds has a very great influence in the composition of rations for fattening fowls.

*Influence of various Feeds upon the acid-basic Metabolism of adult Fowls.* A. S. Solun, A. K. Danilova and  
N. J. Chlebnikov, Transactions of the Poultry Research  
Institute of U.S.S.R. in Moscow, Vol. II, 1934, p. 51.

**Summary :**

Investigation of the acid-basic balance (method of determining  $\text{NH}_3$  of the mixed excreta of fowls) when replacing 30 percent of the basic ration of adult cockerels by various feeds have shown :



1. The positive influence of succulent feeds (potatoes, beets, carrots), of fish-flour and caseine.
2. The sharply acidotic influence of boiled meat, eggs and vegetable protein.
3. The acidotic influence of the majority of cereals tested, at the exception of barley and millet.

*Effect of fluorine in the nutrition of the chick.* C. H. Kick, R. M. Bethke, and P. R. Record, Poultry Science, Vol. 12, 1933, No. 6, pp. 382-387.

The Ohio Experiment Station carried on with White Leghorn chicks a series of four tests using various forms of fluorine as a mineral supplement to a basal diet.

It was found that chicks could tolerate more fluorine in the form of calcium fluoride than in the form of rock phosphate or sodium fluoride. The fluorine of the latter supplements exerted similar effects on growth and feed consumption. When chick rations contained more than 0.036 percent of fluorine in one or the other of these forms, growth and feed consumption were decreased in direct proportion to the fluorine content of the ration. The fluorine ingested did not significantly affect the percentage of bone ash in the tibias at 8 weeks of age. The clotting time of the blood was reduced in chicks fed increased amounts of fluorine in the form of sodium fluoride or rock phosphate.

*The effect of different calcium intake levels on hatchability and eggshell formation.* Rhode Island Sta. Rpt., 1933, p. 75.

The influence on hatchability and eggshell strength of rations containing 0.24, 0.37, 0.66, and 1.05 percent of calcium in the mash was tested.

## PROTEIN SOURCES

*The Value of Buttermilk Powder in Poultry and Chick Food.* Dr. B. J. C. te Hennepe, The Poultry Record, Dec. 1934.

From reports published at the World's Poultry Congress in Rome it appears that buttermilk powder is a splendid protein source in food for breeding flocks and especially when it is the only protein source in the food.

Buttermilk powder is also a best protein source in chick food.

*A Comparative Study of Value of Milk Solids, Peanut Meal, Meat Meal and Fish Meal in fattening Broilers and Friers.* E. F. Thomas, N. R. Mehrhof and W. F. Ward, Leaders, West central Florida Station, Agric. Exp. Station, Gainesville, Florida, State Project No. 228.

At the end of the sixth week in Projects 226 and 227, S. C. White Leghorn cockerels were separated from the pullets, and divided into four groups. The cockerels were sorted so that a representative number from the experiments in Projects 226 and 227 would be in each of the

four pens. All pens received the same basal ration. In addition, Pen 6 received dried buttermilk; Pen 7, meat meal; Pen 8, fish meal; and Pen 9, ground peanut kernels. A sufficient amount of each protein supplement was added to the basal ration to provide a total ration containing the same percentage of digestible crude protein.

Weekly total and individual records have been kept of weights, feed consumption, and mortality of these cockerels.

*The preservation of skimmilk curd for poultry feeding.*  
R. N. Davis, Jour. Dairy Sci., Vol. 16, 1933, No. 5,  
pp. 495-499.

The Arizona Experiment Station undertook a study to find a practical method for preserving skim milk curd on the farm in a satisfactory condition for poultry feeding and to determine the length of time the curd may be held.

It was found that skim milk curd could be preserved for 6 mo. or longer by adding formalin (40 percent formaldehyde) at the rate of 1:1,000. The acidity of the whey must be at least 0.7 percent at the time the formalin is added. This preserved curd was a good source of animal protein for poultry.

*Method of determining Digestibility of Protein in the mixed Excreta of Fowls.* Transactions of the Poultry Research Institute of U.S.S.R. in Moscow, Vol. I, 1933, p. 28.

**Summary :**

1. Checking of Folin's method on pure reagents has shown the need of lengthening the time of distillation up to 15 hours.

2. Determination of  $\text{NH}_3$  by Parnas-Wagner's method modified by Maysurian, when distillation passes during 45 minutes provided quite satisfactory results.

3. Separation of the nitrogen compounds of urine and faeces of a bird should be done in the following manner: a weighed amount of about 1 gr. of mixed excreta is boiled in absolute alcohol for  $2\frac{1}{2}$ -3 minutes. The oxalate of urea, the creatinin and creatin pass into the solution, while in the precipitate remain oxalic acid ammonium, uric acid and indigestible protein. The precipitate is transferred into a flask;  $\text{Na}_2\text{CO}_3$  and  $\text{NaCl}$  are added and steam (under vacuum) is passed through. The isolated  $\text{NH}_3$  is caught by  $\frac{1}{100} \text{H}_2\text{SO}_4$ . The content of the flask is further transferred into a beaker, neutralized by  $\text{H}_2\text{SO}_4$  and the residue is allowed for some time to rest. Further the filtrate is heated and the residue comprising the indigestible protein is washed out with hot water and burned according to Kjeldahl's method. The alcohol filtrate is then divided into two parts: by one the urea is determined (by the addition of 40 percent of  $\text{KOH}$  or  $\text{NaOH}$ ), and by the other part the nitrogen of the alcohol filtrate according to Kjeldahl's method. By the difference between the nitrogen of the alcohol filtrate and the nitrogen of the urea, the nitrogen of creatin and creatinin are then determined.

*A Method of Determining the Biological Value of Protein in the Study of Avian Nutrition.* J. L. St. John, O. Johnson, J. S. Carver and S. A. Moore, Jour. Nutr. 5: 267, May 1932.

Using the method for mammals developed by Mitchell and the method for the determination of uric acid developed by St. John and

Johnson, a method suitable for the measurement of the biological value of protein fed to chicks and birds has been developed.

*Some Causes and Effects of a high free fatty acids Content of the Meatscraps in Poultry Rations.* C. H. Schroeder, G. K. Redding and L. J. Huber, Poultry Science.

**Summary :**

1. In these tests the use of meatscraps high in free fatty acids very markedly increased the death rate and decreased the rate of growth, feed consumption and, slightly, but consistently, retarded calcification.

2. Evidence is presented which indicates that the inferior results obtained from meatscraps high in free fatty acids are probably not so much attributable to the free fatty acids per se but to an inactivation of vitamin A and, to a lesser degree, of vitamin D, presumably due to oxidation.

3. The formation of free fatty acids in meatscraps kept in storage is accelerated by increased temperature, especially when the increase in temperature is accompanied by an increase in the moisture content of the meatscraps.

4. Sterilization inhibits the development of acidity in fat even at higher temperatures and higher moisture content.

5. Different lots of meatscraps differ in the rate at which decomposition of the fat takes place.

6. Although a low free acidity of the fat gives no assurance that a meatscrap is desirable in every respect, a high acidity at once indicates an inferior product. To that extent, the free fatty acids of meatscraps can be used as a criterion for the quality of the product.

*Utilization of Ground Soybeans for Poultry.* A. E. Tomhave, Agric. Exp. Station, Newark, Delaware, Bull. No. 179, 1932.

The data covering three years' work with ground soybeans in the ration for laying pullets are in process of compilation. The data indicate a rather limited use for ground soybeans as a protein supplement in rations for laying pullets.

Eggs from the soybean rations were again placed in cold storage to study the keeping quality under cold storage conditions. The eggs were kept in storage for periods of four, six, and nine months. This study showed that 10 percent of ground soybeans in the laying ration did not have detrimental effects upon the keeping quality of the eggs produced by these rations.

Yearling hens are now being used in this project. Preliminary results indicate that ground soybeans can be used to better advantage as a protein supplement for yearling hens than for pullets. Fertility and hatchability studies made on the eggs produced in the soybean pen indicate that ground soybeans do not decrease the fertility and hatchability of the eggs.

Part II of this project deals with the value of ground soybeans in the ration for rearing chicks. Results obtained from the soybean rations are similar to those reported last year: i. e. a growing ration containing 6.9 percent of ground soybeans, produced results practically equal to a check ration containing soybeans. The data covering three years of this study will be compiled for publication during the coming year.

*Protein Requirements of laying Hens.* J. S. Carver and D. Brazie, Agric. Exp. Station, Pyallup. Washington, Bull. 275, 1932.

Protein balance experiments are being conducted with glots of hens housed in nutritional batteries. Several protein levels of herring fish meal are being compared.

*Protein Requirements of Growing Chicks.* J. S. Carver and D. Brazie in cooperation with the Division of Chemistry, Agric. Exp. Station, Pyallup. Washington, Bull. No. 275.

Three lots of chicks were grown on three different levels of herring fish meal protein for a period of 10 weeks. The three protein levels used were 12, 16, and 20 percent. The protein intake and the protein elimination were measured for each lot. At the age of 10 weeks each of the three lots of the protein levels of 12, 16, and 20 percent were divided into three separate lots and fed on protein levels of 12, 16, and 20 percent herring fish meal. The efficiency of growth on each of the several levels of low, medium, and high protein will be determined.

*Protein Requirements of Chickens.* J. S. Carver, J. L. St. John, T. E. Aspinwall and Flor., Poultry Science, Vol. II, 1932, p. 57.

Several different levels of milk protein were fed throughout the entire growing period to White Leghorn chicks. The effects of feeding of these several levels of protein were studied with relation to the rate of sexual maturity, the size of eggs, and the efficiency of the use of the proteins.

*The Biological Values of Proteins.* D. Brazie in cooperation with the Division of Chemistry, Agric. Exp. Station, Pyallup. Washington, Bull. No. 275.

This study was undertaken to determine the biological values of various protein concentrates and blends of these protein concentrates used in commercial chick and laying rations in this state. The protein concentrates that will be studied are two different types of meat scraps, two fish meals, and skim milk powder, and blends of these several protein concentrates. The biological values of each concentrate and blend will be computed at the conclusion of the eight weeks' growing period.

*Feeding Excess Protein to Laying Hens.* M. Wayne Miller and Gordon E. Bearse, Annual Report of the Western Washington Experiment Station for the fiscal Year ending March 31, 1930, Pyallup. Washington, Bulletin No. 18, W. new Series.

Many commercial poultrymen in western Washington are following the practice of feeding extremely high protein rations to birds by feeding heavily in a wet mash and as supplementary feeds such proteins as fish meal, meat meal, fresh horse meat and blood. These are fed in addition to regular rations of a high protein mash and scratch grain.

In order to determine whether such extreme rations were detrimental to the welfare of the birds the project was started.

The plan of the experiment was to furnish different lots of birds rations of high protein content in order to see if any abnormal condition of birds' internal organs could be produced. Thirty pounds of a protein concentrate were added to 70 pounds of basal all mash ration and fed to six lots of six birds each of which were confined in small pens. Fish meal, dry skim milk powder, dry horse meat, beef scrap and "stick" (evaporated packing house tank water), were used as the protein concentrates.

An additional pen was used as a check which was fed a ration with only 15 percent protein concentrates.

At the end of six months all living birds were killed and examined and weights taken and conditions observed of liver, spleen and kidneys.

No mortality occurred in the fish meal or milk pens. The only mortality occurring in the check pen and horse meat pen was a result of pickouts or cannibalism. Two birds in the beef scrap pen died and two in the "stick" pen died. Both birds on the beef scrap and one on the "stick" ration died of egg trouble while one of the birds on the "stick" ration died and after death it was observed that death was caused by fatty infiltration of liver and kidneys.

Although the condition of the various organs were observed, and the weights taken, a very few abnormal conditions were observed except in cases of misplaced egg material. For this reason detailed results are not given.

The production was fair when one considers that the birds were so closely confined. The "stick" pen gave the poorest production.

#### **Conclusions :**

1. All mash rations containing 30 percent of a protein concentration did not produce a high percent of organic trouble.
2. An extremely high protein ration did not prevent cannibalism (pickouts).

## **SUNDRIES**

*Digestibility of Feeds in Poultry.* A. K. Danilova, A. S. Solun, N. S. Chlebnikov, B. A. Poliakov, Transactions of the Poultry Research Institute of U. S. S. R. in Moscow, Vol. I, 1933, p. 19.

#### **Summary :**

1. When using the methods of a complete isolation of the nitrogen compounds of urine (uric acid uria ammonia, creatin and creatinin), coefficients of protein digestibility were obtained exceeding 10 to 20 percent those of other investigators.
2. Important variations of coefficients of crude fiber digestibility in separate animals were noted, which seems to depend on an insufficient length of the previous experimental period.
3. The addition of grit to the ration does not improve the digestibility of the crude fiber ; however, it increases the coefficient of protein, fat and carbohydrate digestibility.
4. When comparing the coefficients of digestibility of cereal foods, fed separately and in the mash, it has been shown that the coefficients of digestibility of organic substance and protein, when they are fed in

a mixture, decrease, with the exception of soia beans. The coefficients of digestibility of fat, when fed in a mash, for such feeds as corn, coya and millet seed, i. e. with a large content of fat, are higher than those of such cereals fed separately. Only oats and oatmeal give a decrease of the coefficients of digestibility in a mixeration. The coefficients of digestibility of the nitrogen free extract increase when feeds are given in a mixture. The digestibility of crude fiber in a mixture is lower than when fed separately.

*On the Problem of Standardizing the Amount of Feed in the fattening of Chicks and Hens.* A. S. Solun and A. G. Troitskaya, Transactions of the Poultry Research Institute of U.S.S.R. in Moscow, Vol. II, 1934, p. 2.

**Summary :**

In regulating the amount of feed according to its content in digestible nutrients when fattening poultry of various weight and condition and in comparing the data of feeding on balanced ration and free feeding,—the following results were obtained :

1. The comparison of the amount of feed given in previously balanced feeding with data of feed really consumed by the bird shows that rationed feeding can be accomplished only in cases when the consumption of the ration corresponds to the age and condition of the bird. In the contrary case the amount of feed really consumed by the bird does not correspond by far to the feed provided.

2. With a satisfactory balanced ration any superfluous feeding or underfeeding of the fowl, even in limits not exceeding 10 percent, leads to a change of the fattening results.

3. Comparison of the results of fattening in balanced and free feeding for fowls of different age indicates great advantages of balanced feeding especially in the fattening of chickens.

4. Initial tentative values of the amounts of digestible nutrients per 1 kg of live weight for fowls of various weight are as follows :

Weight of fowl in gramms	Digestible nutrients in gramms	Weight of fowl in gramms	Digestible nutrients in gramms
300— 600 . . . .	65	1200—1300 . . . .	50
700— 800 . . . .	55	1500 . . . .	45
900—1000 . . . .	53	1700 . . . .	40

Our further problem is to define more accurately these tentative standards on the basis of the data available and to proceed to a more detailed calculation of the maintaining and productive part of the ration.

*Poultry Nutrition.* J. L. St. John, Otto Johnson, Clayton Kempf and Virginia Hefty, in cooperation with the Division of Poultry Husbandry, Agricultural Experiment Station, Pyallup. Washington, Bull. No. 275, Dec. 1932.

Further results on the protein requirements of poultry were published in Poultry Science 11:45, showing that at least 15 percent of protein should be included in a chick ration while from the twelfth to the twenty-sixth week less protein may be used. A high protein level was not injurious to the birds. A paper was also published in the Journal of Nutrition 5:267 describing a method of determining the biological value

of protein. Necessary data on the endogenous and metabolic nitrogen elimination were given. This method makes possible the measurement of the biological value of feeds for poultry, while previously such a value could only be measured with mammals. Using this method the biological value of different fish meals has been determined. The biological value of such a ration is high and good growth is secured with a ration supplemented with fish meals. A protein level of 15 percent seems to be optimum for chicks up to 12 weeks of age. This work has been continued to the sixty-second week, including therefore seasonal variations in requirements and the effect on egg production. Work also is being done on the effect of changing the protein level when chicks are 10 weeks of age.

A study has also been made on the relative value of various domestic and foreign meat meals. Mineral levels in their relation to protein metabolism are important. Mineral balance studies indicate that mineral levels are more important than the ratio between elements. Work on the standardization of the method for ash determination for use in this work also has been done.

### *Rations for Growing Pullets.* A. E. Tomhave and C. W. Mumford, Agric. Exp. Station, Newark, Delaware, Bull. No. 179, 1932.

The primary purpose of this project is to evolve a growing ration that will produce at the time of sexual maturity, a well-developed pullet possessing the necessary vigor to remain in good health during the pullet year of production. In a preliminary study four pens of 218 chicks each were used. After the 20-week growing period the four pens of pullets were removed to the laying house where observations and records are being kept during the first year of production. Following are some observations made from this preliminary experiment:

1. Supplementing an all-mash ration (18.4 percent protein) with whole grain feeding after the 10th week of the growing period does not increase the body weight of the pullet at the end of the growing period.

2. Lowering the protein content of the growing mash from 18.4 percent to 17 percent by the addition of corn meal, produces a pullet lighter in weight when production begins than does the ration of higher protein content.

3. The pullets receiving 3.6 percent of bone meal in the ration were heavier at 20 weeks of age than those pullets receiving no bone meal in the ration.

The results from the first year of production are not complete for the four lots at this time, and will be reported at a later date. The project is being continued with four lots of growing pullets.

### *Germinated Oats for Laying Birds.* A. E. Tomhave and C. W. Mumford, Agric. Exp. Station, Newark, Delaware, Bull. No. 179, 1932.

Two pens of laying pullets are being used in this project. A complete report on this project cannot be given at this time as the birds have not yet completed the laying year. To date the pen receiving no germinated oats has suffered the greater mortality and the average egg production per bird has been slightly less than the pen of birds being fed germinated oats. The project will be continued.

## *Research in Poultry Nutrition at Cambridge. 1934.*

The work on the fat metabolism of poultry has reached the stage where it is possible to give information of practical importance to poultry keepers. We have already shown that the protein in poultry fattening rations can be cut down considerably without affecting the rate of fattening and quality of carcass produced, and this fact alone must have cheapened the cost of fattening. In addition, we have demonstrated that palm oil is an effective substitute for mutton fat in cramming mixtures. It has further been established that fats in poultry foods are readily transferred to the body storage depots. If soft fats, such as soya bean oil, hemp oil, or linseed oil are included in the food, the body fat becomes oily and soft in character. On the other hand, hard fats such as palm kernel oil, palm oil or mutton fat, give rise to a body fat of a hard or firm consistency. By using a fat of suitable type in fattening or cramming mixtures, the poultry fattener is thus in the position of producing a carcass of any type that the market requires.

It has also been established that the feeding of soft fat alters the character of the egg yolk fat, whereas feeding hard fats has no such effect. The character of the fats present in the egg can, therefore, to some extent be controlled by the nature of the food fed. Since the fat in the egg serves as a source of energy for the developing chick, this latter fact may eventually prove of significance in the investigation of the factors determining the hatchability of eggs.

## *The Effect of Feeding Crotalaria seed to Chickens and Other Birds.* E. F. Thomas, Agric. Exp. Station, Gainesville, Florida, State Project No. 192.

The studies which were started in 1932 have been completed and the following conclusions reached: *Crotalaria spectabilis* seed are toxic for chickens, quails and doves when fed or eaten in considerable numbers. Chickens will eat *C. spectabilis* seed under natural conditions and sickness and death may be produced. Quail did not eat *C. spectabilis* seed placed before them, neither did they eat them in the field. Turkeys were not poisoned by as many as 1,000 *C. spectabilis* seed. *C. striata*, *C. grantiana*, *C. incana* and *C. intermedia* seed were not toxic when force fed in five and 10 gram doses to chickens and quail.

## *Use of Peanuts and Peanut Products in rearing Turkeys.* West central Florida Station, Agric. Exp. Station, Gainesville, Florida, State Project No. 224.

Sixty-nine poults, six weeks old were divided into 2 groups according to thrift and weight. Both pens received the same basal ration. Pens received supplementary protein from dried buttermilk, meat meal, and fish meal; while the ration in Pen 2 was supplemented with ground peanut kernels. Both rations have the same percentage of digestible crude protein.

Weekly records have been kept on feed consumption, mortality and body weights.

## *Self-Selection of Feeds by Hens.* A. E. Tomhave and C. W. Mumford, Agric. Exp. Station, Newark, Delaware, Bull. No. 179, 1932.

Data obtained from this project were published as Delaware Agri-



cultural Experiment Station Bulletin No. 174, November, 1931. Conclusions set forth in this bulletin were as follows:

1. Yearling Leghorn hens do not have the ability or the natural instinct to select the proper proportions of different feeds placed before them in separate feeders to meet their physiological needs.

2. Yearling Leghorn hens do not vary the choice of their feeds according to their production when allowed to choose the ingredients of their laying rations.

3. Yearling Leghorn hens will consume a larger quantity of a mixed mash daily, than when feed ingredients are fed in separate feeders. The physical properties of feeds are improved by combining in a mixed mash as compared with the separate feed. Unpalatable feeds that may be necessary for the well-being of the hen can be combined in a mixed mash without seriously affecting the palatability of the mash.

4. Man can make a more intelligent selection of feeds for the needs of a producing hen than she is capable of doing herself.

## GENERAL

*Individuality of pullets in balancing the ration.* J.C.Graham, Poultry Sci., Vol. 13, 1934, No. 1, pp. 34-39.

Using six Rhode Island Red pullets housed in individual compartments in a battery, the Massachusetts Experiment Station conducted a test over a 30-week period to determine the ability of birds to balance their diet. Whole corn, whole oats, and mash were fed ad libitum.

The intake of the individual feeds varied considerably for each bird from day to day and week to week. However, the variation in protein level for individual birds from day to day was small. Some individuals produced well and gained weight on a 12 to 13 percent protein level, while others used a 14 to 15 percent level. Nonlaying birds were thrifty and prepared to lay on an 11 percent level. Habit appeared to play an important part in the diet of individual birds, and some were extremely constant in their protein intake level over long periods. The results indicate that nutritional requirements are governed by an urge of the organism.

*A comparison of confinement and range for laying stock.*

A. B. Godfrey and H. W. Titus, Poultry Science, Vol. 13, 1934, No. 1, pp. 56-60, figs. 2.

The U. S. D. A. Bureau of Animal Industry conducted three experiments to compare the performance of birds confined to a laying house with birds having access to a limited range.

Confined birds that received cod-liver oil and sunshine laid as many eggs as, and tended to lay larger eggs than, birds on limited range. Confined birds receiving sunshine but no cod-liver oil showed no significant difference in production or egg size as compared with the limited-range birds. When birds were confined there was a tendency to lay a larger number of eggs during the winter months, while birds on limited range tended to lay a larger number of eggs during the spring months. No deleterious effects on fertility or hatchability were noted in confined birds if cod-liver oil was fed.

*Bulkiness of food as a factor in poultry feeding.* T. Shaw and E. A. Fisher, Jour. Min. Agr. (Gt. Brit.), 40, 1933, No. 4, pp. 327-337.

In this series of tests it was demonstrated that the bulkiness of the individual feeding stuffs was not an important factor in the practical feeding of poultry. The bulk of dry bran was not detrimental to its use in considerable amounts in poultry mashes. The bulkiness of the entire ration and not of its individual constituents must be considered in compounding rations. In a wet mash bulk is of more importance than it is in the same mash when dry.

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# PHYSIOLOGY AND ANATOMY

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*Effects of endocrine extracts on the early development of the chick.* W. R. Breneman, Science, Vol. 79, 1934, p. 434.

In tests with 568 chick embryos treated mostly with antuitrin-S and theelin, the sexes were found to be 305 females, 170 males, and 93 unknowns. The early mortalities which occurred after sex could be determined were predominantly of female embryos, running as high as 83 percent. Since the extracts have fractions which affect the female reproductive system, the results appeared to be significant.

*Studies on the Mechanics of Feather Development.* A. Berdyshev, Transactions of the Poultry Research Institute of U. S. S. R. in Moscow, Vol. II, 1934, p. 62.

## Summary :

Summing up the results of all our experiments and observations we are able to make the following conclusions :

1. The feathering develops under the control of a complex of factors.
2. For a correct analysis of the process of feather formation it is necessary to consider the whole system of connections and interrelations between the growth of feathers and other physiological and morphogenetical processes in the bird's organism.
3. The size and age of birds are the factors influencing the growth and dimensions of feathers.
4. The White Leghorn hens have primary and body feathers longer than those of pullets, with the exception of tenth primary feather.
5. The 10th primary of a hen is shorter than the 9th, whereas with a pullet the 10th primary on the contrary is longer than the 9th one.
6. This phenomenon may be used as an indicator for determining the age of poultry.
7. In the size of primaries in pigeons there exists sex dimorphism.
8. With an equal length of the 1-8th feathers of both sexes, the 9th and 10th of the female is shorter than that of the male per 10 mm.
9. The difference in the size of the 9th and the 10th primary in males and females of pigeons may be explained by the growth of those feathers under different concentration of the sex hormone in the blood of the birds.

10. The same explanation may be given in the case of a difference in the length of the 10th primary feather in pullets and in hens.

11. Thyroidectomy of birds (chicks) is accompanied by a decrease in the intensity of feather growth.

12. In the absence of influence of the nervous system the development of feathering goes on slowly.

13. By innervation injury, the period of formation of the primaries in pigeons is lengthened.

14. The topographical position of feathers on the body surface is reflected in the character of their growth.

15. The nearer feather is to the body, the more rapidly it grows, and sooner finishes its growth.

16. The following periods of time are necessary for the complete formation of primary feathers in pigeons: for the 1th, 2nd, 3d and 4th 50 days (average), for the 1th, 2nd 44 days, for the 7th and 8th 35 days, for the 9th and 10th 30 days.

17. After the falling out of feathers by the process of natural moult and when picked,—the closing of the feather bag takes place.

18. Artificial opening of the feather bag is accompanied by a more intense growth of feathers, than when the bag is in a closed state.

19. The difference in the rate of growth in a closed and in an open bag is observed only during the passage of the feather through the bag.

20. The final length of the feathers, having grown up in open bag, as well as on a denervated wing does not change.

21. The determination of feather parts takes place at early stages of its development.

22. After issue of the stump out the feather bag, its parts are already determined as to form.

23. The age of the regenerating feather is of importance for the growth rate of the subsequent regeneration.

24. The earlier the feather is picket out from the beginning of its regeneration, the slower will grow during second regeneration.

25. Partial growth of the feather is possible after the death of the animal.

26. Feathers just beginning to grow and feathers finishing their growth give the smallest increment after the bird's death.

27. Feathers in medium stages of development have a more intense growth after the death as compared with the above mentioned feathers.

28. The problem of the mechanics of feather formation is a complicated one and demands additional and more thorough analysis.

*On the Importance of the Thyroid Gland in the moulting Process.* W.T. Larionov, Transactions of the Poultry Research Institute of U.S.S.R. in Moscow, Vol. II, 1934, p. 49.

#### Summary:

On the ground of the results of experiments on the feeding of poultry with thyroid preparations, some authors (B. Zavadovsky,

Krizenecky) are inclined to explain the nature of the moulting process on the basis of changes in the activity of the thyroid gland.

The available experimental data, however, do not allow to prove irreproachably the correctness of the conclusion.

During natural moult the epithelium of the thyroid gland is subjected to hyperplasia, which probably indicates an increase of its activity.

Experimentally produced analogous changes in the thyroid gland, however, are not accompanied by moulting.

The difference in the intensity of the natural moult of hens of various production classes, when artificial moulting is provoked by the effect of equal doses of thyroid gland—is preserved.

Data obtained in the present work (§§ 3, 4 and 5) limit the premises to a purely endocrinological theory of moulting.

The further work on the moulting problem must be extended by the study of the regularities of the natural moult and by the use, together with the physiological, also of the philogenetical methods of investigations.

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# DISEASES

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## INFECTIOUS DISEASES

### PULLORUM

*The diagnostic value of the rapid test with stained antigens vs. the tube agglutination test for pullorum disease.*  
W. A. Higgins and C. H. Schroeder, Poultry Science, 12, 1933, No. 5, p. 323.

In this abstract of an article presented at the annual meeting of the Poultry Science Association in August 1933 it is reported that "a very close but not quite complete agreement was attained between the results from the tube agglutination test as compared with the rapid, whole-blood test when using stained antigens supplied by the U.S. Department of Agriculture, the Michigan State College, and two commercial laboratories manufacturing the antigen under patent permit from the Bureau of Animal Industry. A third commercial antigen gave unsatisfactory results.

"Excepting the one lot of stained antigen which produced results at marked variance, the rapid, whole-blood test with stained antigen was of equal diagnostic value as the tube agglutination test for *Salmonella pullorum*."

*Pullorum Disease.* J. Biely, E. A. Lloyd and W. Roach,  
Issued by the British Columbia Department of Agriculture, Victoria, B. C. Oct. 1933.

Contents: Cause, Cycle of Infection, Instruction and Spread of Pullorum Disease, Symptoms of Pullorum Disease. Course of the Disease. Postmortem appearance, Control of Pullorum Disease in chicks. Description of Incubators, the Agglutination Test. Accuracy of the Agglutination Test. Prevalence of Pullorum Disease. The Economic Aspect of Pullorum Disease. Eradication.

In spite of conflicting reports which have been issued from certain quarters, and a lack of understanding in some instances, the value of the Agglutination Test has become universally recognised within recent years and is now more widely practiced than ever before. One of the main reasons for this is the realisation on the part of practically all poultrymen of the serious nature and possible menace of Pullorum Disease. Moreover, the perfection and standardisation of the test have created additional confidence in its reliability and usefulness. The very considerable reduction effected in the cost of the test through simplification and expediency of its operations has brought it down to a very economical basis.

*Studies on Pullorum Disease. I, The Influence of different temperatures in Brooding.* J.M. Moore, W.L. Mallmann and L.R. Arnold, State College, East Lansing, Mich., Journal of the Am. Vet. Med. Ass., Vol. 84, 1934, p. 526.

**Summary :**

1. Chicks hatched from reactor hens and brooded at varying temperatures for the first week had a much higher morality than chicks hatched from tested hens and brooded under similar conditions.

2. In the four brooding temperatures used viz. 96, 88, 80 and 72° F. Chicks hatched from the tested stock did not show such an increase in mortality as the temperature in compartments was lowered, as did the chicks hatched from reactor stock.

3. Chicks hatched from tested hens and brooded in the same brooder compartments with chicks hatched from reactor hens, showed a higher mortality than when they were brooded by themselves under similar conditions.

4. Chicks hatched from tested stock have a much better chance of living when they are subjected to hardship, or poor management after they reach the flock owner, than have those chicks hatched from untested stock.

5. The purchase of clean stock is recommended.

*A study of pullorum disease in baby chicks as shown by the effect of different temperatures in brooding.* W.L. Mallman, J.M. Moore, and L.R. Arnold, Poultry Science, 12, 1933, No. 5, p. 323.

This is an abstract of an article presented at the annual meeting of the Poultry Science Association in August 1933. In studies conducted it was found that different brooder temperatures influenced to a marked degree the mortality of infected and noninfected chicks.

*Pullorum Infection in 21,791 Hens imported from Italy. Über serologische, pathologisch-anatomische und bakteriologische Befunde bei 21,791 aus Italien in die Schweiz eingeführten Junghennen.* Dr. H. Grieder, Veterinär-pathologisches Institut der Universität Zürich, Schweizer Archiv für Tierheilkunde, Vol. 67, 1934, p. 57.

In Switzerland pullorum has been included in the Law against Infectious stock Diseases. The blood agglutination test is applied to all imported hens.

**Conclusions :**

1. The rapid blood test can be easily applied for massed inspections. The positive result in 100 % of the cases agreed with the serum test.

2. Of 21791 hens imported from Italy 2,7 per thousand proved to be infected.

3. Of hens imported from Romagna 1,3 per thousand were infected and from Verona 8,3 per thousand.

4. The percentage among young early hatched hens was higher than among late hatched hens.

5. In 59 % of the cases the post-mortem agreed with the agglutination. The bacteriological examination showed a 69,5 % agreement.
6. Of the positive hens only 30 % showed signs of emaciation.

*The Recovery of Salmonella Pullorum from the Faeces of adult Carriers of Pullorum Disease.* R. E. Graeves, R. S. Dearstyne, H. C. Ganger, Journal of Agricultural Research, Vol. 47, 1933, p. 44.

**Summary :**

1. An organism with the true morphological, cultural and biochemical characteristics of *Salmonella pullorum* was isolated from the faeces of 21 known adult carriers of pullorum disease.

2. The isolations recovered were obtained from one bird of proven constant reaction to the test for pullorum disease, and from one bird of proven intermittent reaction.

3. The organisms isolated from the faeces of these birds produced the disease when administered per/os to proven negative adult birds, and one strain produced the disease in 3-day-old chicks when administered in the same way.

Lytic factors that were sufficiently strong to prevent the recovery of *Salmonella pullorum* from the faecal samples were repeatedly encountered.

*Experiments with Carrier-Hens. Kontrollversuche an Hühnern, die durch die Frischblutagglutination als pulloruminfiziert ermittelt wurden.* Dr. H. Rievel, Tierseuchen-Institut, University-Leipzig, Deutsche Tierärztliche Wochenschrift, 1934, p. 97.

For a period of six months experiments were carried out on 7 positive hens and 1 negative hen. The blood and faeces of these hens were free of pullorum bacilli during this period. Of the 68 eggs laid 2 contained pullorum bacilli.

When slaughtered six of the hens showed typical changes. Of 5 hens 4 were proved to contain pullorum bacilli and 1 *B. gallinarum*.

At the commencement of the lay the agglutination titer of the blood rose to 6400. In 90 % of the cases the rapid blood test agreed with the serum agglutination test.

*Hereditary resistance to pullorum disease.* E. Roberts and L. E. Card, Poultry Science, 11, 1932, No.6, pp. 373, 374.

Reporting upon the progress of work under way at the Illinois Experiment Station, it is pointed out that more than 28,000 birds have been used. Average results for the seven years have shown a survival in the resistant strain of 65.3 percent of the chicks exposed to the disease by inoculation at 24 hours after hatching. The corresponding figure for survival among unselected stock is said to be 27.5 percent. When crosses were made between the resistant and unselected stocks, the resulting chicks proved to be almost as resistant as those of the selected strain.

"Corroborative evidence has been obtained from a study of oriental fowls. In North China a breed was found in which pullorum disease was present. In Central China there was found another breed in which the disease was not present insofar as could be determined. The average



of two years' tests gave a survival of 50.3 percent for the former and 12.4 percent for the latter. If resistance and susceptibility are hereditary, or in part due to hereditary factors, natural selection would tend to eliminate the susceptible individuals and produce a population more resistant than a population which had not been subjected to such natural selection."

*Virulence of Salmonella pullorum.* W. N. Plastringe and L. F. Rettger, Jour. Infect. Diseases, 54, 1934, p. 23.

In studies conducted at the [Connecticut] Storrs Experiment Station, "marked differences were observed in the virulence of individual strains of *S. pullorum* for chicks, adult fowl, rabbits, and guinea pigs. Some strains were found to be highly virulent for both chicks and adult birds; others possessed a low degree of pathogenicity for chicks but were highly virulent for adult birds; and still others were relatively avirulent for both young and adult chickens.

"The data presented suggest that pronounced changes can be induced in the virulence of some strains of *S. pullorum* by the action of bacteriophage. One particular strain which was moderately virulent for chicks and only slightly virulent for adult birds was rendered practically avirulent for chicks and highly virulent for adult birds by treatment with bacteriophage. This condition appeared to be dependent on the establishment of a certain balance between the activity of the bacteriophage and the growth of cells.

"In general, passage through animals had no appreciable effect on the morphologic, colonial, and agglutinative characteristics of the variants employed. The feces of adult birds artificially infected with *S. pullorum* were found to contain the pullorum organism at irregular intervals when examined from 102 to 194 days following exposure."

*Serologic Experiments with B. Pullorum and some of the bacteriae belonging to the Group of Salmonella.* Einige serologische Untersuchungen betreffendes *B. Pullorum* und einiger der *Salmonella*-Gruppe zugehörenden Bakterien. L. Bahr and N. P. C. Christensen, Maanedskrift for Dyrlaeger, Vol. 45, 1933, p. 417.

1. The agglutination reaction of serum from hens infected with pullorum is not specific. The serum from the hens also agglutinated *B. paratyphi* B, *B. aertryck*, *B. abortus equi* and *B. enteritidis* Gaertner.

2. *B. paratyphi* A, *B. suipestifer*, *B. Voldagsen*, *B. Flexner* D and H and paratyphoid bacilli were not agglutinated.

3. After being fed with Ratn bacilli it was not possible to cause infection or agglutination in chickens and hens.

4. An agglutination of 1:50 may be considered positive.

*Investigations concerning the B. pullorum and bacteria pertaining to the Salmonella group.* L. Bahr and N. P. C. Christensen, Vet. Jour., 89, 1933, p. 561.

Contributing from the State Veterinary Serum Laboratory, København (Copenhagen), the authors report upon a series of agglutination examinations with fowl typhoid sera from hens and *S. pullorum*, *S. sanguinarum*, and related bacteria, together with some peroral in-

fection experiments with ratin bacilli on twenty-one 24-hour-old and 9 older (4- to 8-week) chickens and 10 full-grown hens.

*Experiments on Swine with Bact. Pullorum. Infektionsversuche mit dem Bakterium pollorum beim Schwein.*

R. Wagener, Deutsche Tierärztliche Wochenschrift, Vol. 42, 1934, p. 180.

As poultry keepers often feed eggs which have not hatched and dead chickens to pigs, the writer carried out investigations with a view to discover whether this might be a danger to the pigs. For a period of seven months two young pigs were fed and injected with infected matter and cultures. No harmful results were observed in the pigs.

*Pendik Bouillon. A special cultivation Base for the Distinguishing of Pullorum and Fowl-Cholera Bacteria.*  
M. Raif, Istanbul-Pendik, Wiener Tierärztliche Monat., 1934, p. 13.

For the preparation of this cultivation medium 1,5 gr. salicylic acid is dissolved in 1000 ccm of ordinary broth. The sterilized liquid is set at PH 7,4 and poured into test-tubes. Neither fowl-cholera nor any other strain of septichemia bacilli can be cultivated in this bouillon but B. pullorum. Para-typhoid A and B, Typhoid, Coli, Paracoli and other kinds of bacter ia can be.

*Virulence of Salmonella Pullorum.* W. N. Plastridge and L. F. Rettger, Jour. Inf. Dis., Vol. 54, 1934, p. 23.

Marked differences were observed in the virulence of individual strains of S. pullorum for chicks, adult birds, rabbits and guinea pigs. Some strains were found to be highly virulent for both chicks and adult birds; others possessed a low degree of pathogenicity for chicks but were highly virulent for adult birds, and still others were relatively avirulent for both young and old chickens. Pronounced changes can be induced in the virulence of some strains by the action of bacteriophage. One particular strain which was moderately virulent for chickens and only slightly virulent for adult birds was rendered practically avirulent for chicks and highly virulent for adult birds by treatment with bacteriophage. This condition appeared to be dependent on the establishment of a certain balance between the activity of the bacteriophage and the growth of cells. In general, passage through animals had no appreciable effect on the morphologic, colonial and agglutinative characteristics of the variants employed. The feces of adult birds artificially infected with S. pullorum were found to contain the pullorum organism at irregular intervals when examined from 102 to 194 days following exposure.

*Thirteenth annual report on eradication of pullorum disease in Massachusetts, 1932-33.* H. van Roekel et al, Massachusetts Sta. Control Ser. Bul. 68, 1933, pp. 8.

In the work with pullorum disease during the season of 1932-33, there was a marked reduction in the number of flocks tested, from 455 flocks with 377,191 birds requiring 420,861 tests of which 0.90 percent were positive in 1931-32 to 335 flocks containing 296,093 birds requiring 300,714 tests of which 0.47 percent were positive.

"The fact that four counties show an increase in percentage of positive tests and the remaining counties a decrease demonstrates that persistent testing is the only effective means of establishing and maintaining disease-free flocks. The average percentage (0.47) of positive tests is the lowest attained in the testing history. Whether such a low percentage can be maintained depends largely upon the economic condition and attitude of the poultrymen."

*Diseases of Poultry. Die wirtschaftlich wichtigen Erkrankungen der Hühnerkücken im Lichte deutscher und ausländischer Forschung. Dr. E. Schürmann, Bonn, Archiv für Geflügelkunde, Vol. 8, p. 209.*

**Summary :**

Modern science has extensively and exhaustively investigated pullorum disease as to etiology, methods of infection, clinical symptoms, progress of the disease and the bacteriological and pathological-histological diagnosis. And yet, in practice, the results of these reearches as to the prevention and cure of this disease, are not at all satisfactory.

With a critical examination of the usual combating or prevention to-day, it has to be admitted that, within the limits of complete prevention, even which the most careful carrying out of precautions, two links in the chain of prevention can never be closed :

1. the hen not being recognized as diseased at the time its blood is tested ; and

2. in close connection with this — the chicken hatched out of such a hen's egg.

The most important task of future disease research must be to abolish these danger-factors.

If we ask as to the methods to be adopted, the following emerges :

Diagnostic methods for the recognition of bacteria-carrying hens have been developed to such an extent that, apart from the height of the titers to be considered as positive in themselves, they do not need to be further treated. But even if the methods have been made nicer as to their certainty of aim, the circumstance still remains that for periods no agglutinines appear in the blood of diseased hens, and, consequently, in this case, the methods are unsuccessful. This is also true with a second blood test, even if it is admitted that through exact, frequent blood-tests the danger-factors are, for the most part, reduced.

This shows that, in spite of all precautions, we must always reckon with the possibility of one or the other chicken being infected. There is not only no prospect of saving this chicken by treatment, but in view of the possible chronic condition, it is so much lost time. We must, therefore, direct our main attention to keeping the non-infected chickens in a healthy condition, and in this respect, answers must be found to the following two questions :

1. Is the natural constitution, i. e. the natural capacity for resistance, decisive or of vital influence or not, with the infection of healthy chickens ?

2. What parts are played by the usual present-day maintenance and method of feeding with the transference of pullorum-disease.

It should here be remarked that experience of animal-breeding shows that the young of high-capacity parents and those of weak constitutions contract disease more easily than others. I remember the susceptibility of the higly-bred races of cattle to udder disease, and the

easy transference (not innateness) of tuberculosis to cows from parent animals which had been weakened by disease.

In my opinion, it is exactly the same with poultry rearing. So long as poultry were kept on farms in Germany and the rearing and maintenance of the hens was carried out within natural limits, pullorum disease was practically unknown in our midst. It is only since the establishment of poultry farms in mass and the transition from natural maintenance to artificial rearing (incubators, batteries) and that with the almost exclusive use of hatching-eggs from hens with approved high egg-laying capacity, that we have known pullorum disease in Germany, the first report being that of Beller's in 1926, as is well known.

The connexion between the rearing and the possibility of infection with the disease is indisputable, and needs clearing up. The necessary experiments would have to proceed along the following lines:

1. a) Hatching-eggs of high-capacity birds would be hatched out in common with a number of hatching-eggs of demonstrably infected parent birds.
- b) Hatching-eggs as with a) would be hatched out by a broody hen,
2. a) Hatching-eggs from peasant's hens reared naturally would be hatched out with a few hatching-eggs of demonstrably infected parent birds in the incubator.
- b) Hatching-eggs as with 2a, hatching out by a broody hen.

These experiments would certainly give us a definite explanation as to whether the weak constitution of a chicken is really decisive for the preservation of the Bact. pullorum or not, and further, whether artificial hatching has a definite influence on the generation of the disease.

Furthermore, the following experiment should be undertaken for the purpose of clarifying artificial rearing and feeding.

Healthy chickens should be brought together with diseased ones, and reared,

- a) under natural rearing conditions (broody hen), and
- b) under artificial conditions (hovers, batteries, modern chicken feed).

I am convinced that an exact carrying out of the experiments mentioned would give us a clear answer to the question according to the reasons of the considerable spread and the devastating effects of the disease and that by stating that the best means of fighting pullorum-disease is to be found in the choice of strong parent-birds, not weakened by overdone, artificial increase of capacity and in a rearing of chickens (especially as regards feed) in as natural a manner as possible.

*Hereditary resistance to pullorum disease.* E. Roberts and L. E. Card, University of Illinois, Urbana, Poultry Science, Vol. XI, 1932, p. 357.

As a result of work begun in 1924 there has been produced by selection a strain of chickens much more resistant to infection by *Salmonella pullorum* than are unselected strains. The difference has been very marked, and the results have been consistent for seven consecutive years. In the various phases of this work more than 28,000 chickens have been used.

Average results for the seven years show a survival, in the resistant strain, of 65.3 per cent. of the chicks exposed to the disease by inoculation at twentyfour hours after hatching. The corresponding figure for survival among unselected stocks is 27.5 per cent.

Crosses were made between the resistant and unselected stocks. The resulting chicks proved to be almost as resistant as those of the selected strain. A back cross of  $F_1$  to resistant gave progeny showing 63.2 per cent. survival, while among the progeny of  $F_1$  to unselected the survival was 38.1 per cent. From these two types of progeny uninoculated chicks were raised for making further crosses. When these were mated to unselected stock the survival of the resulting chicks was 72.7 per cent. and 34.9 per cent. respectively.

The  $F_2$  generation showed a range from low to high resistance. From each extreme a selection of females was made, using the survival of progeny as the measure of resistance. When mated to unselected males in 1931 the high segregates gave a survival of 69.4 per cent., while the low segregates gave only 8.0 per cent.

All of these results can be explained most logically on the basis of existence of hereditary factors affecting resistance and susceptibility. Corroborative evidence has been obtained from a study of oriental fowls. In North China a breed was found in which pullorum disease was present. In Central China there was found another breed in which the disease was not present in so far as could be determined. The average of two years' tests gave a survival of 50.3 per cent. for the former and 12.4 per cent. for the latter. If resistance and susceptibility are hereditary, or in part due to hereditary factors, natural selection would tend to eliminate the susceptible individuals and produce a population more resistant than a population which had not been subjected to such natural selection.

*An apparatus for pipetting serum in making the agglutination test for the detection of carriers of bacillary white diarrhoea.* Veterinary Record 13, 1933, p.966.

By the use of an apparatus devised for pipetting serum from 400 to 600 samples can often be handled by one worker per hour with the aid of assistants. This is said to be based upon the plan of the apparatus described by Beaudette in 1929.

*Studies on incubator hygiene.—III, Germicidal properties of formaldehyde, sulfur dioxide, chloropicrin, and chloracetophenone.* R. Graham and V. M. Micheal, Poultry Science, 13, 1934, p. 40.

In this continuation of the studies of incubator hygiene the authors report having found that "formaldehyde released in germicidal amounts for *S[almonella]* pullorum in a forced-draft incubator was not retained in the incubator in sufficient amounts three hours later to destroy the organism. Double amounts of formaldehyde employed at time of hatching proved injurious to chicks, precluding the use of larger amounts of formaldehyde than previously recommended in routine hatching. A massive *S. pullorum* infection introduced into the incubator at hatching time was appreciably reduced by fumigation as judged by chick livability and bacteriological examination of contaminated swabs subjected to fumigation.

"Sulfur dioxide, chloropicrin, and chloracetophenone were found to be impractical for incubator disinfection."

*Pullorum disease (contagious white diarrhea) of poultry.*  
W. T. Johnson and E. M. Dickinson, Oregon Sta. Bul.  
313, 1933.

This is a practical summary of information on pullorum disease and means for its control.

## TYPHOID AND PARA-TYPHOID

*Paratyphoid Bacilli in Poultry. Zum Vorkommen von Bakterien aus der Ruhr- und Paratyphusgruppe beim Haushuhn.* Prof. Dr. K. Beller and Dr. M. Zeki, Deutsche Tierärztliche Wochenschrift, Vol. 42, 1934.

### Conclusions :

1. It was not possible to show para dysenteric bacilli among 531 head of poultry which had suffered from various diseases.
2. Fowl typhoid bacilli were found in two cases.
3. Paratyphoid bacilli were found in two cases, one of which proved to be of the Breslau type.
4. In poultry which suffer from diseases entailing disturbances of the stomach and intestines *B. coli* as well as bacilli, which have but little effect on milk sugar, are found. These bacilli are but slightly pathogenic.
5. These experiments prove that both hens and hen eggs seldom contain germs which are dangerous to human beings.

*Natural Resistance to Disease in the Chicken. I. The Effect of Selective Breeding on natural Resistance to Fowl Typhoid. II. Bacteriological studies upon surviving Birds of the resistant stock in relation to Progeny Resistance. III. The Comparative Resistance of different Breeds.* W. V. Lambert, Iowa State College, The Journal of Immunology, Vol. 23, 1932, p. 229, 241, 253.

### Summary :

I. The report presents the results of five generations of selection for resistance to a standard infection with the fowl typhoid bacterium in the chicken. A marked increase in the resistance of the selected population has resulted. The observed mortalities in the selected stocks, from the first to fifth generations, being 39.8, 15.4, 15.0, and 9.4 percent. In the unselected (control) populations tested concurrently the respective mortalities were 89.6, 93.2, 86.2, 86.4, and 85.0 percent.

A combined total of 3355 chicks, 1999 in the selected and 1356 in the control stock was used in these studies. Reciprocal crosses of selected (resistant) with unselected birds demonstrated that the male, as well as the female transmits resistance to the offspring; and that a passive transfer of immunity was not a great, if existent, factor in the enhanced resistance of the selected progeny.

II. Extensive bacteriological examination of the organs of 61 breeding birds, all survivors of a fowl typhoid infection, showed 21.3 percent of them to be carriers of *S. gallinarum*. The ovary was the most frequent seat of localisation of the bacterium in the females. Only 1 of 7 males examined proved to be a carrier. Chicks hatching from the carrier

hens proved slightly, but not significantly, less resistant than those from non-carrier hens. The mortality among 129 chicks from carrier hens was 44.2 percent, and among 366 chicks from non-carrier hens 40.2 percent. The non-carrier hens were those from which the organism was not isolated.

Data secured from bacteriologic examination of a small number of chicks killed at various intervals after infection, suggest that chicks from the selected population are more refractory to the fowl typhoid organism than are chicks from an unselected population. Agglutination tests on the blood serum of these chicks indicate that the young chick lacks the ability to develop agglutinins of high titer, if at all.

III. A total of 1,508 chicks from five breeds and strains of the fowl, and of one group consisting of hybrids between two of the breeds, were infected in the same way with a standard dosage of virulent fowl typhoid bacteria. The percentage mortalities observed for the various breeds were—White Plymouth Rock, 79.7; White Leghorn, 87.7; White Leghorn, II. 86.3; White Wyandotte, 93.4; Rhode Island Red, 94.4; and for hybrids between the White Leghorn and Rhode Island Red, 86.4. A number of these differences are greater than would be expected from random sampling.

Differences in the rate of mortality also were observed for the different breeds. Significant differences in resistance were not observed between the chicks from separate colony matings, one male with several females in one strain of the White Leghorn breed.

*Results of Combatting Typhoid and Tuberculosis in Hungary. Über den Erfolg der staatlichen Bekämpfung des Geflügeltyphus und der Geflügeltuberkulose in Ungarn in den Jahren 1928-1932.* Prof. Dr. Manninger, Berliner Tierärztliche Wochenschrift, Vol. 50, 1934, p. 210.

For the last five years the cost of combatting pullorum and tuberculosis has been borne by the State. The work of collecting blood samples and the carrying out of the tuberculin test is done by four veterinary surgeons. In 1932 there were 182 farms comprising 49,953 birds under control. From experience it has been proved that the disease is easiest combatted on small farms. Various tables showing the results have been compiled.

In 1932, 182 farms were under control for the combatting of tuberculosis. Of these 165 were free from tuberculosis.

Farms which are free from pullorum and tuberculosis for a period of two years receive a certificate from the State.

*A Chronic Carrier of Fowl Typhoid with testicular Focalisation.* H. C. Gauger, N. C. State College of Agriculture, Journal Am. Vet. Med. Ass., Vol. 84, 1934, p. 248.

A case is reported in which an organism isolated from the testicles of a bird showed morphological, cultural, biochemical and serological characteristics of *Salm. gallinarum*. The subject, in all probability, was a chronic carrier with testicular focalization of organism. Further work is necessary to prove or to disprove that similar cases may be responsible for the dissemination of fowl typhoid.

*Hematology of the fowl.* F.W. Cook and R. S. Dearstyne,  
North Carolina Sta. Tech. Bul. 44, 1934.

The first part of this contribution deals with studies of the normal avian blood (pp. 4-26) and part 2 with studies of the hematology of avian typhoid (pp. 26-42).

The studies of the normal blood deal with the cellular and hemoglobin content of the blood of 80 normal fowls. "Numerical counts of erythrocytes showed the highest percentage of instances (31.3 percent) of the 80 studies made lying between 2,760,000 and 3,000,000 per cubic millimeter, one count running less than 2,000,000 and two showing over 4,000,000. The total white cell counts show the greatest percentage of instances (26.3 percent) having a count of from 11,000 to 15,000 per cubic millimeter, 76.3 percent of the 80 studies made having a white cell count of 20,000 or less. In the differential studies of white cells the heterophile count was found to be from 41 to 45 percent in 21.3 percent of the 80 cases studied, the eosinophiles from 1 to 3 percent in 37.5 percent of the cases; the monocytes showed from 7 to 15 percent of the total white cells, the small lymphocytes 21 to 25 percent, the intermediate lymphocytes 1 to 3 percent, and while the large lymphocytes were absent in 54 studies 25 counts revealed 1 to 3 percent of this type of white cell."

The period of incubation of avian typhoid was found to range from 14.5 to 92.5 hr. after inoculation, the prodromal period being from 56.5 to 108.2 hr. after inoculation and the fastigium from 70.75 hr. to the commencing of the period of decline. "In the period of incubation of avian typhoid the total white cell count, the heterophiles, and the monocytes made a decided numerical increase and the erythrocytes, hemoglobin, and the lymphocytes a decided decrease from the established normal. The hemoglobin content decreases in greater relative proportion than the decrease in erythrocytes. Observations on the morphology of the cellular content of the blood during this period reveals no marked change from the normal. In the prodromal period the heterophiles, small lymphocytes, and erythrocytes continue their trends observed in the period of incubation. The hemoglobin decreases relatively in the same proportion shown by the erythrocytes. The total white cell count is increased. A typical morphological picture of the cells is presented in this period. Immature monocytes predominate the picture. In the period of fastigium the blood trends noted in the prodromal period are emphasized. There is a drastic increase in total white cell count. The combined periods of decline and convalescence show a blood picture tending toward return to normal according to the rapidity with which the bird has thrown off the disease. The return to normality of the white cell count is retarded to a greater extent than that of the cellular elements."

*Infectious Enteritis in Ducks. Untersuchungen über den Ansteckungskreislauf bei der infektiösen Enteritis der Enten.* J. Schaaf, Archiv für Tierheilkunde, Vol. 67, 1934, p. 224.

The experiments proved that by enteritis infection in ducks an infection cyclus occurs which agrees with pullorum in chicks.

In ducks, however, infection through the medium of the faeces plays a very important part. In chicks the disease usually has an acute course whereas in adult birds the infection remains latent. The infected ducks eject the bacteria with the faeces and the eggs. With regard to the faeces



the bacilli are still ejected six weeks after the infection and in the case of the eggs 3-1/2 months after feeding. Of 217 eggs from 11 infected ducks 3.7 % were internally infected and 20.7 % externally. When the blood test was applied to the infected ducks they reacted positively to a dilution of 1:40 to 1:400. Healthy ducks reacted at the most to 1:20.

**Paratyphoid in Ducks.** J. Csontos, Allat avorsi Lapok, 1933, p.13. (Ref. Rec. de Méd. Vétér., Vol. 1934, p. 230.)

Csontos found paratyphoid bacilli in the eggs and embryos of ducks and specific agglutinins in 50 % of the ducks.

The same thing was experienced with turkeys and geese among which the mortality of the young birds was very high.

**Poisoning by Duck Eggs.** *Les Empoisonnements par les œufs de Canes contenant des Bacilles pathogènes.* W.M. Scott, Office Internationale d'Hygiène publique, Vol. 25, 1933, p. 828. (Ref. Zentralblatt für Bakteriologie, Referate, Vol. 112, 1934, p. 542.)

In England cases of sickness have been observed after the consumption of duck eggs. B. aertrycke was isolated from the eggs. The blood of the ducks which had laid the eggs agglutinated B. aertrycke of 1/50 to 1/3000.

The writer suspects that the ducks had become infected as a result of eating dead field mice. Of three families who became ill one farmer died. The eating of raw duck eggs is not advisable.

**Paratyphoid-Bacilli in Duck Eggs.** *Über das Vorkommen von Bakterien der Paratyphusgruppe in Enteneiern.* Prof. Dr. K. Beller and Dr. W. Reinhard, Berliner Tierärztliche Wochenschrift, Vol. 50, 1934, p. 226.

#### Conclusions:

Of 33 large duck farms 7 = 21 % proved to be infected with bacteria of the paratyphoid group. 2 to 8 % of the eggs from these farms proved to be infected with paratyphoid bacilli. On 3 farms Gärtner bacilli were found and on 4 Breslau bacilli.

**Poisoning by Duck Eggs.** *Nahrungsmittelvergiftungen durch Genuß roher Enteneier?* B. Grzimek, Deutsche Landwirtschaftliche Geflügelzeitung, 1934, p. 425.

The majority of the cases of sickness caused by eating duck eggs were only mild. The fact that the illness was caused by eating duck eggs is only proved when the same enteritis germs are found both in the remains of the eggs and in the faeces of the patients.

**Food Poisoning by Duck Eggs.** *Lebensmittelvergiftungen nach dem Genuß von Enteneiern. Hinzuziehung des beamteten Tierarztes.* Deutsche Tierärztliche Wochenschrift, Vol. 42, 1934, p. 265.

As many cases of food poisoning by duck eggs have occurred in Prussia recently the Minister for Home Affairs has made certain regu-

lations which must be carried out in such cases. Doctor and veterinary surgeon must work together. The poultry on the suspected farm must be examined. The origin of the infection must also be discovered. The health of other animals on the farm must also be controlled. The doctor must make himself acquainted with the health of the staff on the farm.

*Salmonella infections in young ducklings and ducks' eggs.*

G. H. Warrack and T. Dalling, Vet. Jour., 89, 1933, p. 483.

The authors report upon losses among young ducklings caused by *S. aertrycke* and *S. enteritidis* (Gaertner's bacillus). The infection of ducks' eggs with these two organisms has been found on many occasions. One source is the infected ovary of the duck producing the eggs. "Such ducks usually show a high agglutinating titer during the period when infected eggs are being produced. The titer falls fairly rapidly, and coincidentally no more infected eggs are laid. Infection of ducklings from outside sources also occurs."

*Spontaneous paratyphoid infection of the pigeon by the Aertryck or Breslau type of Salmonella: Experimental vaccination.* C. Cernaianu and I. Popovici, Compt. Rend. Soc. Biol. Paris, 112, 1933, p. 829.

The authors report that paratyphoid of pigeons, not previously reported from Rumania, occurs in that country and is always caused by the Breslau or Aertryck type of the *Salmonella* organism. Young pigeons are particularly susceptible to this organism. Vaccination experiments with a formolized gelatin culture have shown that a solid immunity against this disease in the pigeon can be secured, particularly by the intramuscular route, which is much more active than the oral. Vaccination even after pigeons became infected prevented further mortality and stopped the outbreak.

*Chicken Flesh as cause of Meat Poisoning. Hühnerfleisch als Ursache einer schweren Fleischvergiftung.* F. Schönberg, Berl. Tierärztliche Wochenschrift, 3rd Nov. 1933.

Schönberg describes a case of meat poisoning, which had to be attributed to the use of chicken flesh. Gaertner bacilli could be cultivated from the marrow of the bones of the consumed chicken as well as from the faeces of the patients. These bacilli were pathogen for mice.

Meat poisoning by means of chicken flesh is very rare; in the literature there are yet a few cases known in which either the *B. enteritidis* Gaertner, or the *B. Aartrijke-Breslau* were encountered. Most probably chicken get infected with Gaertner bacilli by cattle and on the other hand with Aartrijke-Breslau Bacilli by water fowls or pigeons; this infection appears much more in water fowls than in chickens.

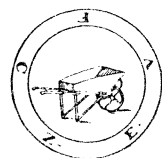
*B. Gallinarum as a cause of Food Poisoning.* R. Müller, Münchener Medezin. Wochenschr. No. 45, 1933, p. 1771.

The writer was given cultures to examine some of which came from patients, who had contracted enteritis accompanied by fever, after eating potato salade and blood sausage and others which had been isolated from the food.

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The germs of these cultures were found to be *B. Gallinarum* and were very pathogene for hens and mice.

Doubtless the abovementioned foods were infected by germ-containing hen eggs which had been used in their preparation. This is the first time that poisoning symptoms caused by *B. Gallinarum* (which were formerly not considered to be pathogene for human beings) have been described. No doubt such cases have occurred often enough before but as the sickness ended quickly and the symptoms did not appear to be dangerous, not much notice was taken and investigations were insufficient.

*Fowl Typhoid in Kenya Colony.* J.R. Hudson, B. Sc. Lond., M. R. C. V. S., Division of Veterinary Research, Kabete, Kenya, The Vet. Journal, Vol. 90, 1934, p. 344.

#### Summary :

1. Fowl typhoid is the most important disease of poultry in Kenya.
2. Fowl typhoid is quite distinct from pullorum disease of chicks.
3. The evidence suggests that fowl typhoid was imported into Kenya by carrier birds.
4. The pathology and bacteriology are discussed.
5. The agglutination test is of no value in the detection of birds actually suffering from fowl typhoid, in the detection of carriers, or in assessing immunity.
6. Vaccination with live attenuated organisms gives good results provided that the birds are not exposed to a very heavy infection.

*Avian Typhus in Denmark.* Journal of the Department of Agriculture, Vol. 31, Dublin, Ireland.

The existence in Denmark of bacillary white diarrhoea, or avian typhus, as it is called, was first discovered in the year 1927. Steps were at once taken to ascertain the extent to which the disease had spread through the country. In the spring of 1928, out of 30 flocks examined, 3 were found to contain reacting birds, but only 22 birds in all were involved. These researches were pursued during the following autumn, winter and spring, with the result that 20 flocks were found to be infected, some to only a slight extent, but others very considerably.

As a result of these preliminary investigations, it was decided, after consultation with the poultry breeding associations, to extend the inquiry. During the period February, 1928, to end of April, 1930, no fewer than 767 flocks were examined. Of these, 473 were found to be free from the disease and 291 (37.9 %) were found to be infected, whilst 3 flocks contained a number of suspicious cases. The total number of blood-tests taken was 131,387, and of these 6,571 (about 5 percent) gave distinct reaction, while 778 (or 0.6 percent) gave doubtful reaction.

The number of reacting birds in the different infected flocks varied widely. Of the 291 infected flocks, 185 had up to 10 percent, 48 flocks had from 10 to 25 percent, and 58 flocks had over 25 percent, of reacting birds.

The inquiry embraced flocks from all parts of Denmark, though the actual number was very small in some districts. The data collected, while not sufficient to indicate the frequency of the disease in any particular district, are considered to afford evidence that bacillary white diarrhoea is fairly widespread in Denmark, and that suitable, well-organised action over a number of years will be necessary in order to stamp it out.

## CHOLERA

*Immunisation against Cholera. Zur aktiven Immunisierung gegen Geflügelcholera mit Saponin-Kulturen.* P. Trajkovic-Hadji. Dissertation. Bundesanstalt für Tierseuchenbekämpfung in Mödling. Berliner Tierärztliche Wochenschrift, 1934, p. 344.

The principle of Mazzucki is the prevention of the diffusion of infectious matters in the body by means of a local reaction at the place of injection caused by saponine. In the tests with cholera it appeared that doses which were otherwise not fatal proved to be so as a result of the action of saponine in the organism. The saponine tests with living cholera bacilli were also unfavourable.

*Anaphylactic Choc in a Goose.* Cernea. Revista veterinaria militara, Jan. 1933.

Cholera serum was injected in doses of 10 ccm. at intervals of 14 days. At the second injection cases of death occurred within 8 minutes.

## TUBERCULOSIS

*Eradicating Fowl Tuberculosis. Over Vogeltuberculose, Tuberculine — en Vaccinatieproeven.* Dr. L. Geurden, Vlaamsch Diergeneeskundig Tijdschrift, Vol. 3, 1934, p. 67.

### Summary:

The author insists in his introduction upon the importance of the actual improving systems for combatting avian tuberculosis. Tuberculine tests and vaccination experiments have rather a theoretic value. He then communicates vaccination experiments with bovine B. C. G. In a first series of those, 10 mgr. were injected intramuscularly in chickens and these animals were exposed during 9 months to natural infection. The mortality by tuberculosis was for the vaccinated hens 34.5 % and for the control birds 26.6 %.

In a second series chickens free from tuberculosis were injected with 5 mgr. B. C. G. and after a monthly isolation, exposed to natural infection. The vaccination appeared to be efficacious during the 11 first months, this period corresponds probably with the allergy period caused by B. C. G. Afterwards tuberculinetests showed that birds who had reacted negatively on avian tuberculine may continue to react in this manner and that birds who reacted positively may show a negative reaction after a long time. At last a series of comparative tuberculine tests was undertaken. Hens who had reacted positively on avian tuberculine did react neither on avian or mammalian tuberculine or on johnine. Fleoline and malleine gave concordant as well as discordant reactions towards avian tuberculine. Finally the author signals that necessarily the preparation of the tuberculines should be improved as well as the methods of tuberculation better studied.

## *Tuberculosis in Poultry.* W.P. Blount, The Poultry World, 1934, July 20.

### Summary :

Statistics show that about 10 percent of birds at laying trials die from tuberculosis, and it is not improbable that an equal proportion of commercial birds are affected by this disease.

It seldom affects pullets, more often being found in hens, and, although the latter usually become emaciated by the ravages of the disease, some remain in good bodily condition.

Lameness and anaemia are the most prominent signs to be found in the living animal.

Post-mortem examination shows small lumps or nodules commonly found in the liver, spleen, intestines, or bone marrow.

There is no treatment.

The disease can be detected by the tuberculin test, which should be applied by a veterinary surgeon, and is not costly.

Affected animals should be killed and burnt and never used for human consumption.

In addition to affecting man, avian tubercular germs often affect pigs and occasionally cattle and other farm stock.

## *Killing Tubercle Bacilli. Desinfektionsversuche bei Geflügeltuberkulose.* R. Helm and F. Moser. Zeitschrift für Infektionskrankheiten, Vol. 43, p. 1.

Tubercle bacilli in pieces of cambric were killed in 2 minutes by 5 % carbolic acid. Kresol, sulphuric acid, formaldehyde and sodiumlye were not suitable. Fresh tubercle bacilli cultures proved to have greater powers of resistance than old cultures.

## *Two avian Tubercle Bacillus Dissociants and two human Tubercle Bacillus strains of different virulence.* T. B. Seibert, E. R. Long and N. Morley. Journal of Infectious Diseases, Vol. 53, 1933, p. 175.

A typical avian tubercle bacillus (van Es iquai) grew in rough (R type), dry colonies on Crang's synthetic medium and in smooth (S type), greasy colonies on Detroff's egg medium.

The S. bacilli were longer, more slender, more beaded and less acid-fast than the bacilli and tended to stratify, whereas the R. type piled up in irregular clumps. The S. bacilli proved more virulent for hens than the R. bacilli. Differences were conspicuous in the spleen. Soon after inoculation with S. bacilli numerous minute tubercles formed which were not caseous and loaded with bacilli.

In hens infected with the R. type at the same time, tubercles were fewer, larger and caseous with few visible bacilli. At a later period the lesions were more nearly alike, but more numerous in the hen infected with the S. type. Chemically the S. bacilli contained less water and more fatty material than the R. bacilli. Two strains of tubercle bacilli of human type grown on the same medium also showed the same chemical differences.

## *Toxicity of sulphuric Acid Solutions for Avian Tubercle Bacilli. Etude de la Toxicité comparée des solutions*

*d'acide acétique et d'acide sulfurique pour le Bacille aviaire et les Bacilles paratuberculeux.* A. Saenz, M. Saldettin, L. Costil. *Comptes rendus de la Société de Biologie*, Vol. 117, 1934, p. 45.

The reaction of avian tubercle bacilli to sulphuric acid solutions is the same as that of mammal tubercle bacilli. Acetic acid is very toxic for mammal tubercle bacilli, less so for avian tubercle bacilli and totally non-toxic for para-tubercle bacilli.

### *Combatting Tuberculosis in Germany.*

The Poultry Association Straupitz-Spreewald have proposed to the Ministry of Agriculture that fowl tuberculosis be included in the Law against stock Diseases. At infected farms the poultry must be penned up and so-called fresh and hatching eggs must only come from farms which are free from tuberculosis.

### *Eradicating tuberculosis from poultry and swine.* E. Lash, U. S. Dept. Agr. Leaflet 102, 1933.

This is a practical account describing the manner in which tuberculosis may be spread among poultry and swine, symptoms of the disease, post-mortem appearance, application of the tuberculin test, and manner of combating the disease in poultry and swine.

### *Passage of the avian, human, and bovine tubercle bacilli into the eggs of infected fowls. Passage des Bacilles tuberculeux aviaires, humains on bovins dans les œufs de Poules infectées.* E. Liverani, *Comptes rendus de la Société de Biologie*, Vol. 115, 1934, p. 135.

Experiments are reported which show that the avian type of the tubercle bacillus frequently passes into the egg and reproductive organs of the spontaneously or artificially infected fowl. Virulent bacilli of the mammalian types—both human and bovine—when intravenously injected into the fowl in large doses may be detected many days later in the same organs and the eggs.

### *Fowl Tubercle Bacilli in Hogs. Beitrag zur Kasuistik der Geflügeltuberkulose beim Schwein.* A. Frölich, *Zeitschrift für Fleisch und Milchhygiene*, Vol. 44, p. 89 and 103.

Typus bovinus were found in 18 out of 20 tuberculosis hogs. In two cases typus gallinaceus were found. These cases are more extensively described. The writer states that avian tubercle bacilli play a part when only a few centres occur in the mesenteric glands.

### *Fowl Tuberculosis in Swine. Zum tuberkulösen Primäreffekt und zur Diagnose der Geflügeltuberkulose beim Schwein.* Dr. M. Junack, *Zeitschrift für Fleisch und Milchhygiene*, Vol. 44, 1934, p. 241.

1. Avian tuberculosis often occurs in swine. Acute forms also occur often.



2. The process has little inclination to calcinate. The diagnosis takes place by post-mortem and the proving of tubercle-bacilli.

3. The bacilli are easily cultivated on glycerine potato cultures.

4. The white mouse is a very suitable animal for the distinguishing of the tubercle bacilli strains.

*Two avian tubercle bacillus dissociants and two human tubercle bacillus strains of different virulence: A chemical and biologic study.* F.B. Seibert, E.R. Long, and N. Morley, Jour. Infect. Diseases, 53, 1933, p. 175.

In the investigations conducted "a typical avian tubercle bacillus (Van Es 1921) grew in rough, dry colonies on Long's synthetic medium and in smooth, greasy colonies on Petroff's egg medium. The S bacilli were longer, more slender, more beaded, and less acidfast than the R bacilli, and tended to stratify, whereas the R bacilli piled up in irregular loose clumps.

"In the few experiments carried out, the S bacilli proved more virulent for hens than the R bacilli. Differences were conspicuous in the spleen. Soon after inoculation with S bacilli numerous minute tubercles formed, which were noncaseous and loaded with bacilli. In hens infected with R bacilli at the same time, tubercles were fewer, larger, and caseous, with few visible bacilli. At a later period the lesions were more nearly alike, but more numerous in the hen infected with S bacilli.

"Chemically the S form of avian bacillus differed from the R form in several respects. The S bacilli contained less water and more fatty material than the R bacilli, and the fatty extracts of the S bacilli possessed higher iodine numbers.

"Comparable chemical fractionations were made of two strains of tubercle bacilli of human type and of different virulence, H 37 and R 1, grown on both Long's synthetic medium and Petroff's egg medium. The appearance of the colonies did not differ on the two mediums, but characteristic chemical differences existed as in the case of the two visibly different forms of avian bacilli."

*Fowl Tuberculosis in Swine. Zur Frage der anatomischen Diagnose der Geflügeltuberkulose des Schweines.* G. Pallaske, Zeitschrift für Fleisch- und Milchhygiene, Vol. 46, 1934, p. 243.

The article handles new points of view but also gives a review of the distinguishing of fowl tuberculosis in swine.

*The Use of Different Concentrations of Tuberculin in the Diagnosis of Tuberculosis of Chickens.* W.H. Feldman, Rochester, Minn. Institute of Exp. Med. The Mayo Foundation. Journal of the Am. Vet. Med. Ass., Vol. 84, 1934, p. 889.

#### Summary and conclusions:

Under natural and experimental conditions, a series of hens aged from one to three years were given injections simultaneously with tuberculin of the usual (50 per cent) concentration and a greatly diluted product containing 0.01 mg. of old tuberculin in each 0.1 cc. of injection.

fluid. All injections were intradermal. The positive reactions elicited by the less concentrated tuberculin were rather consistently inferior to those provoked by the tuberculin of standard (50 per cent) strength. Also many more positive reactions were obtained by the use of the more concentrated tuberculin than were secured by the weaker product. The results seem to justify the following conclusions:

1. Tuberculin of standard concentration (50 per cent) is of greater reliability in the diagnosis of avian tuberculosis than a product in which the active principle has been diluted to a concentration comparable to that suitable for the Mantoux test for human beings.

2. The nature, pathogenesis, and the subsequent course of tuberculosis of fowls probably differs sufficiently from that of mammals to require a tuberculin of greater potency for diagnostic purposes.

*Tuberculosis and Paratyphoid in Ducks. Tuberculose en Paratyphus bij Eenden en eenige andere Eendezichten.*  
Dr. J. Jansen. Tijdschrift voor Diergeneeskunde, 1934, p. 1025.

**Summary:**

From a district, where tuberculosis was suspected, 100 ducks were examined. 34 autopsies of ducks suffering from tuberculosis were performed. In most cases tuberculosis of the liver, peritonitis and much liquid in the abdominal cavity was noted. In the organs nodules sometimes are absent, but by means of a Ziel-Neelsen preparation diagnosis can be readily established in most cases, the organs being nearly always rich in bacilli, which are often situated in great groups.

Cases of tuberculosis of the air-sacs and pulmonary tuberculosis were also encountered.

Tuberculosis of the intestines was rarely observed and mostly not extensive. In these 34 ducks tubercle bacilli were demonstrated in the chest musculature, heart and pericardium, round about the trachea, in the lungs, air-sacs, proventriculus, intestines, liver, spleen, kidneys, pancreas, serous membranes, salpinx, fallicles, bone marrow.

6 autopsies of ducks with chronic oöphoritis are reported; in all these 6 cases a paratyphoid bacillus could be cultivated from the ovaries.

(Twice a simultaneous infection of paratyphoid and tuberculosis was diagnosed.)

12 ducks had died of cloacitis.

*The Cultivation and Egg-Transmission of the Avian Tubercle Bacillus.* H. J. Stafseth, R. J. Biggar, W. W. Thompson and Lisa Neu. Bacteriological Section, Michigan Agr. Exp. Station, East Lansing, Mich. Journal of the American Veterinary Medical Ass., Vol. 85, 1934, p. 342.

**Summary:**

1. Positive tuberculin tests were usually obtained four to six weeks following artificial infection. Birds infected intramuscularly became sensitized most readily. A few birds, though infected, failed to react.

2. Acid-fast granules and otherwise morphologically atypical organisms were found in eggs and reproductive organs of infected hens. Evidence was obtained to suggest that these granules represented stages in the life cycle of the tubercle bacillus.

3. Tubercle bacilli were isolated from 14.96 per cent of 93 eggs from artificially infected hens.

4. In Raebiger's work the heaviest percentage of egg infection was found ten to 14 days following feeding of tuberculous material to the bird. The failure, in our work, to find organisms before 36 days following artificial infection of the bird was perhaps due in part to poor production and concurrent disease during the first four weeks of the experiment.

5. Tubercle bacilli were recovered from only two of four artificially infected eggs.

6. Acid-fast granules were found in eggs in 36 to 57 days following artificial infection of the bird.

7. Cultures of tubercle bacilli were obtained in 35 to 46 days following artificial infection of the birds.

8. The hatchability of the eggs from artificially infected hens was very low, while attempts to prove that chicks may contract tuberculosis from eggs of infected hens were unsuccessful.

9. Gross lesions of tuberculosis in the reproductive organs were found in three hens, two naturally and one artificially infected.

10. Cultures from apparently normal reproductive organs of nine tuberculous hens yielded cultures of acid-fast organisms.

11. Long's synthetic medium, to which were added eggs and brilliant green, gave the most abundant growth of the five media used. Petroff's egg medium showed growth in a little shorter time than the rest.

12. A carbon dioxide tension of about 10 per cent seemed to promote the growth of tubercle bacilli.

## PARALYSIS

*The Etiology of Fowl Paralysis (Neurolymphomatosis gallinarum-Pappenheimer), Leucosis and allied Conditions in the Domestic Fowl.* Preliminary Report. M. W. Emmel, Gainesville, Florida, Agr. Exp. St. Journal of the Am. Vet. Med. Ass., Vol. 85, 1934, p. 96.

In a series of papers, the first of which are now being prepared for publication, the author expects to submit evidence to show that: 1. the same etiological agent is responsible for fowl paralysis, leucosis in its various forms, and other allied conditions in the fowl; 2. the primary etiological agent is non-specific in that any one of a number of micro-organisms of the paratyphoid and typhoid groups of bacteria may serve as an inciting agent; 3. enteritis, most commonly caused by intestinal parasites, is a necessary predisposing factor; 4. cases of fowl paralysis, leucosis, and allied conditions so induced are comparable to naturally occurring cases.

*Range Paralysis.* G. Vianello. La Clinica Veterinaria, Dec. 1933.

Description of an enzootic, of range paralysis in Lombardy. The writer did not succeed in transmitting the disease to healthy birds.

*Investigations with Marek's Paralysis. Beobachtungen über die Marek'sche Hühnerlähme im Jahre 1933.* Dr.

H. Hartwigk. (With one coloured plate of blind eyes.)  
Tierärztliche Rundschau, Vol. 40, 1934, p. 139.

**Conclusions :**

1. Marek's paralysis is a virus-disease of young fowl.
2. In 1933 it was discovered in 12.5% of the hens sent to the Institute at Halle, which showed an increase of 8% as compared with 1932. In the affected flocks the percentage of birds attacked was from 5% to 20%.
3. The sickness reached its highest level in August 1933, thus occurring chiefly among 4-5 months old hens.
4. Neither coccidia and worms, or the content of vitamins, minerals and proteins in the food have any influence on the disease. Inbreeding seems to have a favourable influence on the disease.
5. The disease is chiefly spread by young hens. It can also be spread by hatching-eggs and baby-chicks.
6. The following are methods of combatting: a) No sale of young hens from infected flocks. b) No sale of hatching-eggs and baby chicks from infected flocks. c) Destruction of all birds which show symptoms of infection. In spring and autumn accurate control of the eyes of all birds and a clearance of all those which show signs of affected eyes. d) Chickens and young hens must be reared on fresh ground.

*Paralysis in Birds. Accidents paralytiques chez les Oiseaux.*  
Prof. Lesbouyries, Ecole Vétérinaire, Alfort. La Revue  
Avicole, 1934, p. 256.

Description of the following cases of paralysis: 1. Nutritional cause, 2. parasites, 3. Marek Disease, 4. Botulisme, 5. Intoxications.

*Inheritance of resistance to fowl paralysis (neurolymphomatosis gallinarum).* J. Biely, V. E. Palmer, I. M. Lerner, and V. S. Asmundson, Science, 78, 1933, No. 2011, p. 42.

Marked differences in resistance of different strains of fowls to fowl paralysis were observed in studies at the University of British Columbia. In one study with 202 chicks, one half were inoculated at from 1 to 7 days of age with tissue from paralyzed birds, but 31.4 percent developed paralysis in those which were not inoculated as well as in those which were inoculated.

Family differences, from no paralysis to exhibits of ratios of 1:1 and 3:1 among the paralyzed chicks from different families, were observed.

*Fowl paralysis.* F. R. Beaudette, New Jersey Agriculture, 1933, p. 2.

Experiments with fowl paralysis have led the author to conclude that the disease is transmitted through the egg, there being no evidence that it is transmitted by cohabitation. In preliminary control work chicks hatched from eggs held near 68° F. for 1, 2, and 3 weeks, respectively, before setting failed to develop the disease, but cases of paralysis developed in chicks from similar eggs all of which had been set within 1 week of laying.

## DIPHTHERIA

*Histology of Diphtheria and Pox. Zur Histologie der Geflügelpocke und Geflügeldiphtherie.* E. Fröhlich, Archiv für Tierheilkunde, Vol. 67, 1934, p. 322.

### Conclusions :

1. The process of pox can be histopathogenetically divided into 3 stages. Two distinct kinds of blisters can be shown in the specifically changed epithel. Eberbeck's experiments are confirmed.
2. The pox-eruptions on the skin and on the mucous membrane of the month are histologically identical. Secondary infections often disturb the purely histological symptoms.
3. Besides unspecific changes, specific changes often occur in the mucous membrane of the nose in cases of pox.
4. The internal organs do not show any characteristic symptoms.

*Special Pigeon-Pox Forms. Formes speciales de l'Affection diphtherovariologique du Pigeon.* J. Lahaye and L. de Saint Moulin. Annales de Médecine Vétérinaire, Vol. 79, 1934, p. 11.

In addition to the form of Torticollis described in 1927 2 cases of localization of the pox on eyes and feet are described.

*Fowl-Pox-Bodies. Untersuchungen über die Vogelpocken-körperchen.* R. Baumann and L. Weißmann, Archiv für Tierheilkunde, Vol. 67, 1934, p. 281.

According to the writer the acidophil bodies in the cellplasm in pox are not degeneration products. The writer assumes that be bodies are connected with the virus and should probably be considered as enclosed colonies of virus.

*Experiments with Pigeons after Infection with Pigeon-Pox-Virus. Immunitätsprüfungen an Tauben nach experimenteller Infektion mit Taubenpockenvirus.* K. Bierbaum and W. Kayser, Tierärztliche Rundschau, 1933, p. 814.

As in the case with fowl-pox-virus no plurality of strain can be assumed in pigeon-virus. As it is a good natured sickness the injection does not always give full immunity to pigeons so that it sometimes happens that serious infection after the vaccination causes sickness.

*A Study of the relative Efficacy of Pigeon Pox and attenuated Fowl Pox Vaccines.* J. J. Kligler, A. Komarov and N. Fiat. Dep. of Hygiene, Hebrew University, Jerusalem. Journal of Comparative Pathology and Therapeutics. Vol. 46, 1933, p. 248.

### Conclusions :

1. No risle of secondary lesions is involved in the use of pigeon pox vaccine.

2. The risk involved in the use of fowl pox vaccine is relatively small in the case of healthy birds, but may be more serious in an unhealthy flock.

3. Pigeon pox vaccine produces mild, promptly healing lesions without secondary involvement.

4. Attenuated fowl pox vaccine produces severe lesions of longer duration, and often associated with secondary lesions in the mouth and comb.

5. The duration as well as the degree of immunity produced by attenuated fowl pox vaccines is greater than that produced by the pigeon pox vaccine. In the latter case the immunity is less solid and approximately 10 percent of the birds remain unimmunised.

*A Study of the Comparative Value of Fowl-Pox Virus and Pigeon-Pox Virus Vaccines for Immunization against Fowl-Pox.* R. E. Lubbehusen and D. P. Ehlers, Division of Laboratories Pennsylvania Bureau of Animal Industry, Harrisburg, Pa. Journal of the American Veterinary Medical Ass., Vol. 85, 1934, p. 324.

#### Conclusions :

1. Pigeon-pox virus vaccination does not produce an immunity sufficiently adequate to warrant its exclusive use in the control of fowl-pox infection.

2. Pigeon-pox virus may be substituted for fowl-pox virus as a vaccine when a short-interval protection is desired and where the advantages of a less pronounced systemic reaction outweigh the potential hazards of inadequate protection against fowl-pox infection.

3. Although its immunizing efficiency is unquestioned, fowl-pox virus vaccination has definite limitations. Birds should be vaccinated when the systemic reaction incident thereto is less apt to be followed by undesirable sequelae.

4. On fowl-pox-infected premises, vaccination of birds between the ages of 30 and 90 days with fowl-pox virus vaccine is recommended.

*On the Identity between the Virus of Contagious Epithelioma of Fowl and the Vaccine Virus.* I. The Gallinization of the Vaccine Virus through Fowl-Passage. II. The Vaccinization of the Epithelioma Virus Through Rabbit-Passage. III. Reversion of the Modified Vira to the Original Ones. IV. Comparison of Pathogenicity Among Vaccine, Epithelioma, Gallinized Vaccine and Vaccinized Epithelioma Vira. V. Conclusion. T. Matsu-mura. Journal of the Japan Society of Veterinary Science, Vol. XIII, 1934, p. 39, 92, 105.

#### Conclusions :

1. The variola-vaccine virus is easily gallinized through fowl-passage.

2. The epithelioma virus can be also vaccinated through rabbit-transfer (testicle and skin).

3. The vaccine virus thus gallinized is reversed to the original vaccine virus through rabbit-passage.

4. The vaccinized epithelioma virus is reversed to the original epithelioma virus through fowl-passage.

5. The vaccinized epithelioma virus corresponds exactly to the vaccine virus in pathogenicity for rabbits and can even produce Guarnieri's body in the inoculated cornea of rabbits. On the other hand, the gallinized vaccine virus can not be distinguished from the epithelioma virus in its behavior to fowl and loses the property of producing Guarnieri's body.

6. From the facts above mentioned, it seems highly probable to us that the variola, vaccine and epithelioma vira are nothing but varieties originated from the same species, as Toyoda already stated.

*The Efficacy of Pigeon Pox Vaccine in the Vaccination of chickens against Fowl Pox.* J. P. Delaplane and H. O. Stuart, Agr. Exp. Station, Kingston, K. 1, Bull. 238, Sept. 1933.

**Summary :**

A number of the chickens which had been vaccinated at 6, 8, 10, 12, and 14 weeks of age with pigeon pox vaccine, and tested for immunity to fowl pox after a duration of 4 months, were found susceptible to artificial and contact infection with fowl pox. White Leghorn pullets vaccinated with pigeon pox vaccine and tested for immunity to fowl pox after a duration of 2 months were all found resistant with the exception of one.

White Leghorn pullets vaccinated with pigeon pox vaccine, while in production or coming into production showed a decline in production beginning two to three weeks following vaccination.

Susceptible birds which were placed in contact with birds vaccinated with pigeon pox vaccine remained free of infection.

Field observations of flocks in which pigeon pox vaccine had been used would tend to confirm these results with regard to the duration of immunity, as a number of outbreaks of fowl pox have occurred among them. It would seem that, until further experimental work should prove otherwise, fowl pox vaccine would be the more reliable product for practical application.

*Fowl pox (sorehead) control by vaccination.* C. M. Bice, Hawaii Sta. Circ. 8, 1933.

\* This is a practical account of fowl pox control by vaccination, particularly through use of a strain of the fowl pox virus applied by the stick method, an earlier account of which work has been noted. This strain of vaccine was developed from lesions removed from chicks that had a natural outbreak of pox at 6 weeks of age. More than 150,000 chicks, varying in age from 4 to 12 weeks, have been vaccinated.

In experimental and field trials during 3½ yr. at the station vaccination of chicks ranging in age from 4 to 12 weeks was successful, the mortality being less than 5 percent. Turkey poultz were successfully vaccinated from the third to the sixteenth week.

A list of 25 questions and answers regarding the disease and its control is appended.

*A virus disease of the canary of the fowl-pox group.* F. M. Burnet, Jour. Path. and Bact., 37, 1933, No.1, pp. 107-122, pls. 2. (Ref. Exp. St. Record, Vol. 70, 1934, p. 249.)

It is pointed out that the disease of canaries described by Kikuth and Gollub in 1932, above noted, is caused by a virus closely resembling certain fowl pox strains. This virus produced massive lesions when inoculated on to the chorioallantoic membrane of the developing egg, an improved technic for this type of inoculation being described.

"By filtration and microphotographic methods the diameter of the virus particles is estimated to be approximately  $0.16\mu$ . The disease is uniformly fatal to canaries, and no success has been attained in attempts to immunize with killed virus. The virus is pathogenic for sparrows producing typical lesions. Only an insignificant lesion is produced in the fowl, but a more definite transmissible inflammatory condition in the pigeon. In neither of these species are epithelial inclusions produced."

Of three fowl pox strains tested, one, Dalling, produced lesions in the canary similar to those produced by Kikuth's virus. The other two fowl pox strains and a pigeon pox strain have failed to induce specific lesions.

The microscopic appearance of the virus is described by J. E. Barnard.

*Treatment of Diphtheria with Hexamethylen-Tetramin.* F. Gmeiner, Wiener Tierärztliche Monatsschrift, Vol. 20, p. 859.

In a flock of 600 hens, among which the disease was prevalent, two injections of 40 % solution of hexamethylen-tetramin were given, with an intermediary period of two days. The dose amounted to 1 gr. per kg. weight. After 5 days 70 % to 80 % of the birds showed signs of recovery. The egg-production, which had already decreased as a result of the sickness, fell still lower owing to the urotropin injections.

*Treatment of Diphtheria with Hexamethylen-Tetramin. Zur Behandlung der Geflügelpockendiphtherie und des ansteckenden Schnupfens beim Geflügel mit Hexamethylentetramin.* G. Fleischhauer, Tierärztliche Rundschau, 1932, p. 661.

No satisfactory results were obtained with injections of a 1 gr. 40 % solution of hexamethylen-tetramin on young birds with contagious roup. The results were better with older birds. A favourable result was obtained 24 hours after injections for diphtheria.

## PEST

*Fowl Pest. La Peste Aviaire.* Dr. Ahmad Mohammed Rachad, Serum Institute, Abassia, Cairo, Bulletin de l'Office international des Epizooties, Vol. 8, 1934, p. 324.

The pest in Egypt does not differ from the pest that occurs in other countries. Newcastle disease is caused by weakened pest-virus and this is also the case with the pseudo-pest described by Lagrange. The disease described by Picard on Java, Rodier in the Philippines and



Cooper in India is identical with Newcastle disease. The disease occurs in hens, turkeys, pheasants, geese and ducks. The disease is especially spread by ecto-parasites. Vaccination has no practical value.

*Fowl-plague in Egypt: Fowl-disease or fowl-plague of Newcastle Egyptian pseudo fowl-plague.* M. Carpano, trans. by E. Talarewitch, Egypt Min. Agr., Tech. and Sci. Serv. Bul. 129, 1933, p. 20.

This is a summary of information on fowl plague as investigated by the author in Egypt.

*The Differentiation of the Viruses of Fowl Plague and Newcastle Disease: Experiments Using the Technic of Chorio-Allantoic Membrane Inoculation of the Developing Egg.* F.M. Burnet and J.D. Ferry, Brit. Jour. Exp. Path., Vol. 15, 1934, p. 56.

Newcastle Disease and fowl plague viruses are highly infective for the developing egg, and the use of this technic for their investigation offers a number of advantages. Newcastle disease virus produces a characteristic lesion in the chorio-allantoic membrane, in which cytoplasmic inclusions can be demonstrated histologically. Comparative filtration studies with egg material indicate that Newcastle disease virus is larger (80 to 120 millimicrons) than fowl plague virus 60 to 90 millimicrons). Newcastle disease virus is more resistant to photodynamic inactivation by methylene blue than fowl plague virus. These differences, in conjunction with the known clinical and immunological differences, point to the complete etiological independence of the two diseases.

*Electrophoresis of Pest-Virus. Über Elektrophoreseversuche mit dem Virus der Hühnerpest.* S. Seidenberg, Zentralblatt für Bakteriologie, Originale, Vol. 130, 1933, p. 335.

**Conclusions :**

1. In the electrophoresis-experiment the pest-virus is attracted to the anode and is therefore negatively charged.
2. But little virus is attracted to the anode. The virus on the anode is not strengthened.

*Identity of Culture-Virus and Blood Virus. Identité du "Virus de Culture" et du "Virus de Sang" de la Peste Aviaire.* H. Plotz, Comptes rendus de la Société de Biologie, Vol. 115, 1934, p. 357.

The 72nd passage of culture in vitro is mortal for hens in a dose of 1/1 million. They die just as quickly as after infection with fresh virus (48-72 hours). By means of experiments on immunised hens according to Straub it has been proved that virus from cultures and the virus from blood are identical.

*Vaccination against Fowl-Pest. Sur les Vaccins contre la Peste Aviaire.* Dr. S. Kondo and Dr. Nakamura,

Ministry of Agriculture Nishigahara, Tokio, Bulletin de  
l'Office international des Epizooties, Vol. 8, 1934, p. 430.

The virulent organs of diseased hens and pigeons can be weakened by chemical means. Chloroform or saponine cause a considerable weakening of the immunising action. Glycocholic acid and formol do not weaken the virus to such an extent. Immunity can be created by attenuated virus but not with dead virus.

## LARYNGOTRACHEITIS

*The Immunology of Infectious Laryngotracheitis.* Ch.  
S. Gibbs, Amherst. Massachusetts Agric. Exp. Station,  
Bulletin No. 295, 1933.

### Summary:

1. In order to be acceptable to the majority of poultrymen, treatments for infectious laryngotracheitis must be cheap, easy to administer, and fairly effective.

2. Since the intravenous and subcutaneous methods of stimulating immunity did not measure up to this standard, they are not recommended for field practice.

3. However, the intravenous and subcutaneous studies were conducted under controlled laboratory conditions and the following fundamental immunological points discovered:—

a) Birds can be immunized against infectious laryngotracheitis by introducing small doses of virus intermittently into some portion of the body other than the respiratory tract.

b) The virus is carried by the blood and may stimulate the production of immune bodies in all tissues directly in touch with the vascular system.

c) Large quantities of virus released into the blood stream at once may be carried to the respiratory tract and lead to the development of active symptoms.

4. The inoculation of the bursa of Fabricius appeared to be the most satisfactory way of utilizing the immunological discoveries brought out in this study for immunizing birds against infectious laryngotracheitis.

5. The best time to vaccinate appeared to be between three and four months of age, or when the bursa of Fabricius had reached its greatest development.

6. Only birds in the best of health are suitable for vaccination against infectious laryngotracheitis.

7. The significance of certain traumatic cysts, blow-outs, and adhesions found in the bursa of Fabricius and adjacent parts of some of the birds after vaccination is not understood, in view of the fact that special care was taken to avoid rough handling.

8. Special care should be exercised in selecting and cultivating tracheal exudate for bursa of Fabricius vaccination in order to exclude pathogenic bacteria and viruses other than the causative agent in infectious laryngotracheitis.

9. Infectious laryngotracheitis tracheal exudates desiccated and preserved by the modified Swift method maintain their virulence for several months.

10. Final judgment should be withheld on the bursa of Fabricius vaccination until carefully controlled experiments are completed to

determine its practical value under range conditions, and the duration of immunity in fowls in heavy production.

*A report of some investigations of infectious Laryngotracheitis.* C.A.Brandley and L.D.Bushnell, Poultry Science, 12, 1933, No. 5, p. 323.

This is an abstract of an article presented at the annual meeting of the Poultry Science Association held in August 1933 on the influence of various agencies and factors on the pathogenicity of the virus of the disease and on some of the possible sources and modes of infection.

"Negative results were obtained on duplicate tests to show the presence of an active virus on the surface of eggs from a flock containing carriers and from a flock with the infection. These tests were made in 5 to 12 hours after the eggs were laid. During this interval the eggs were stored at 20° to 25° C. (It has been found by subsequent tests that the virus, diluted 1 to 300, would live on eggshells for 12 hours at 25° and 5 hours at 38°.)

"Filtration of fresh and dried virus suspensions were regularly successful through Berkefeld V and N, but not with W filters, using nutrient broth and yeast extract as suspending vehicles. The loss of potency due to filtration was from 10 to 100 times. Filtered and unfiltered virus in 1 to 300 suspensions remained infective for 50 days at 8°.

"Immune serum from 'carrier' individuals subsequently treated with massive doses of virus neutralized 4 times its volume of a highly virulent (1-300) virus suspension and prevented the appearance of symptoms in susceptible birds inoculated as long as 44 hours previously with 10 infective doses of virus. The addition of testicular extract (the Rynal's factor) did not make the virus pathogenic for ducks, guinea fowl, pigeons, rats, or guinea pigs; nor did it increase the number of positive inoculations by the intravenous route in chickens. Serial passage of the virus through baby chicks did not alter the virulence for mature chickens."

*Some Studies of infectious Laryngo-tracheitis. A Preliminary Report.* C. A. Brandly, Manhattan, Kan. Kansas State College, Journal of the Am.Vet. Med. Ass., Vol.84, 1934, p. 588.

**Summary :**

1. The virus of infectious laryngotracheitis within or upon the surface of the egg does not seem to survive, except for short periods, in the environment to which the hen's egg is subjected during incubation.

2. The spread of laryngotracheitis virus by way of the eggs from infected or carrier hens would, therefore, not seem to be important.

3. The development of normal chicks from infected or carrier flocks as well as from eggs artificially inoculated on the tenth day of incubation further indicates that the danger of infection via the egg is not significant.

4. The results of the inoculations of eggs incubated for ten days support the field observations that laryngotracheitis infection in a flock may directly or indirectly reduce the hatchability. Further critical investigations of this problem are planned.

5. The method and technic of Bouges for modifying the embryonic nourishment of the chick may be adapted to the study of the effect of disease infection upon the embryo.

*The Propagation of the Virus of Infectious Laryngo-tracheitis on the Chorio-Allantoic Membrane of the Developing Egg.* F.M. Burnet, Brit. Jour. Exp. Path., Vol. 15, 1934, p. 52.

Laryngotracheitis virus may be propagated in the chorio-allantoic membrane of the developing egg. There is a great deal of variation in the macroscopic appearance of the lesions, but the most typical form at the fourth or fifth day after inoculation is probably that of a plaque of grayish thickening in the membrane, surrounded by a zone of whiter appearance about a millimeter wide. In some cases there are several such two-zoned plaques. The lesions produced in the membrane are due primarily to proliferative and necrotic changes in the ectodermal layer; proliferating cells frequently show typical intranuclear inclusions similar to those found in the tracheal lesions. Material from the third and seventh egg generation of virus was inoculated intra-tracheally into chickens. An emulsion from two eggs (third generation) gave typical symptoms. Birds inoculated from the seventh generation material showed no symptoms but showed definite thickening and inflammation of the tracheal mucosa.

## LEUCOSIS

*Transfusion Experiments with the Blood of Leukaemic Chickens.* F. P. Crank and J. Furth, Arch. of Path. 1932, Vol. 14, p. 660.

The similarity between Roussarcome and poultry leucosis has already attracted attention. It has been confirmed by recent experiments (Furth 1932) that poultry leucosis can be transfused by a cell-free agent, which passes through bacteria-filters, resists freezing and drying-up and can be stored in glycerine.

The direct proof of the tumor-character of the cells in poultry-leucosis has however not yet been given.

The difference between the transmission of leucosis by cells or by cell-free filtrate can for a great part depend on the place where the agent is, chiefly intracellular or apart from the cells.

The experiments by Crank and Furth described here, were carried out in order to prove that the transfusion of large numbers of leucotic cells into the blood course of another hen causes an autonomous growth of these cells.

In these experiments 15-35 cc. blood from a hen with severe myeloid leucosis were injected into young hens after an equal quantity had been tapped. Of the 15 hens which received injections 9 died of leucosis within from 2-3.5 days.

Compared with spontaneous leucosis cases the lethal end comes very quickly. The autonomous, unbridled increase of the leucotic cells is still more clearly apparent when it is observed that the number of these cells is increased 5-20 times within 1-1.5 hours after the injection.

The histologic examination showed that the capillary and sinus of various organs, especially the spleen, liver and lungs, were filled to overflowing with leucotic cells (leucostasis). Contrary to this there is no noticeable heaping of these cells in the bone-marrow; this is in so far significant that it proves that the increase of cells is solely due to the injected cells and does not depend on activation of the bone marrow.

If the hen which received an injection does not die, then the leucostic cells seem to disappear quickly from the blood; in one hen, for instance, the number of leucocysts counted after the injection were: before the injection 17,000, 1 hour after the injection 218,000, 3 days after the injection 34,000.

It is especially in the spleen and the liver that the phagocytare cells are found to be laden with remains of leucostic cells.

On the basis of these experiments it may therefore be assumed that when unripe myeloid cells are activated by the leucosis agent they conduct themselves completely autonomically, thus as tumor cells.

One could therefore expect that under favourable conditions they could increase in vitro just as tumor cells. This however does not agree with the experience with humane leucostic cells in tissue cultures; these then begin to show symptoms of ripening.

*Transmissible Leucaemia. Recherches sur la Leucémie transmissible (érythroblastose) des Poules.* Ch. Oberling, M. Guérin and V. Boic, Comptes rendus de la Société de Biologie, V. 112, 1933, p. 559.

The authors suggest that in future transmissible leucaemia should be called "érythroblastosis" as the main changes take place in the red blood corpuscles.

*Erythroblastic Leucaemia or Erythroblastosis transmissible of Hens. La Leucémie érythroblastique ou érythroblastose transmissible des Poules.* Ch. Oberling and M. Guérin, Bulletin du Cancer, 1934, 23, 38.

A review of the present position of the poultry leucosis question in which recent experiments by Fürth, Engelbreth-Holm, Battaglia-Lienati and Jarmai are discussed. The various forms of leucosis are discussed and illustrated by coloured plates.

*Leucosis of the common chicken.* W. H. Feldman and C. Olsen, The Mayo Foundation, Rochester, Minn. Journal of the Am. Vet. Med. Association, Vol. 84, 1934, p. 488.

#### Summary:

Rather frequently among domestic chickens there occurs a fatal blood dyscrasia in which there is commonly profound anaemia associated with leukemia. The leukemic state is due to excessive numbers of myeloblastic cells, among which cells of the erythroblastic and granuloblastic series may be recognised. Aside from the blood-vascular changes the most significant lesions are hyperplasia of the bare-marrow, liver and spleen. The disease is readily transmissible to other animals of the same species, but little is known of the physical characteristics of the factor or substance capable of transmission.

The disease has many features common to neoplasm, and we are inclined to believe it should be classified with this group of diseases.

*Lymphomatosis, Myelomatosis and Endothelioma of Chickens caused by a filtrable Agent. I. Transmission Ex-*

*periments.* J. Furth, Journal Experimental Medicine, Vol. 58, 1933, p. 253.

A new transmissible strain of leukosis of chickens is described that causes (a) lymphomatosis with or without tumor formation, and with or without leukemia, (b) Myelocyclomatosis with or without leukemia, and (c) Endothelioma. All of these diseases are transmissible by material free from viable cells, and the available evidence indicates that they are caused by a single filtrable agent.

*Transfusion experiments with the blood of leukemic chickens.*

F. P. Crank and J. Furth, Arch. Path., 14, 1932, No. 5, pp. 660-670, figs. 3. (Ref. Exp. St. Record, Vol. 70, 1934, p. 247.)

In experimental work conducted, 9 of 15 fowls into which leukemic blood had been transfused died of leukemia from 2 to 3½ days after the transfusion. "The fatal leukemia in these instances was associated with multiplication of the transfused cells. Thus, when immature myeloid cells of the fowl have been stimulated by the filtrable agent of leucosis, they assume the character of tumor cells and are capable of autonomous growth. A considerable proportion of the transfused cells was rapidly removed from the circulation in all the fowls. The spleen and the capillaries of several organs, mainly those of the liver and the lung, are active in performing this function. The bone marrow plays little part in the removal of the immature myeloid cells. In susceptible fowls, the cells retained multiply in these sites; in resistant fowls, they are disposed of by mononuclear phagocytes of the liver and spleen."

*Leucosis in a Swan. Leukose by een Zwaan.* Dr. L. Geurden, Vlaamsch Diergeneeskundig Tijdschrift, Vol. 3, 1934, p. 208.

Description of a case of spontaneous leucosis observed in a swan.

## OTHER INFECTIOUS DISEASES

*Infectious Diseases of Poultry. Les Maladies infectieuses des Volailles.* Dr. C. Cernaianu, Laboratoire vétérinaire Kichinau, Bulletin de l'Office international des Epizooties, Vol. 8, 1934, p. 241-324.

Description of various diseases with the most recent data concerning investigations by the writer.

Pullorum. Of the 62 strains examined by the writer none appeared to form acid in dulcitol. This did occur with 49 strains of *B. gallinarum*, 59 formed no acid in maltose and 3 did. When the cloaca was infected the hens became positive. Sometimes this infection of the cloaca led to the ovary becoming infected. The rapid blood test gives as reliable results as the slow method. The results obtained by pullorum injections in the wattles are less favourable.

This is followed by descriptions of "Diseases of Ducklings caused by *B. anatum*" Diseases of Chicks caused by *B. coli*, *B. suispestifer* and Coccidiosis.

Fowl Typhoid. Infected birds sometimes react, but very weakly, to the agglutination test so that both agglutination and vaccination should be used in infected flocks.

Cholera is the most general of the diseases in Roumania. The urine is the chief means of expulsion of the cholera bacilli from the body. Good results are obtained by a double injection of dead vaccin. The method of preparing this vaccin is given.

Diphtheria. Injections of pigeon-pox-virus gave good results. In cases of sickness injections of hexamethylentetramin (10 % solution, 1 gr. per Kg. body weight) acted favourably.

The following are also described: pigeon-pox, roup, tuberculosis, infectious leucaemia, paralysis, paratyphoid, pseudotuberculosis and spirochetosis.

*A Hemophilic Bacterium as a Cause of Infectious Coryza in the Fowl.* C.P. Eliot and M.R. Lewis, Department of Bacteriology, School of Hygiene and Public Health Johns Hopkins University, and the Departement of Embryology, Carnegie Institution of Washington, Journal of the Am. Vet. Med. Ass., Vol. 84, 1934, p. 878.

**Conclusions :**

1. A pleomorphic, hemophilic, Gram-negative bacterium has been isolated from uncomplicated infectious coryza of the chicken, for which the name *Hemophilus gallinarum* is proposed.

2. Pure cultures of this organism regularly produce coryza in the chicken when inoculated intranasally. The bacterium can be re-isolated from the infected bird and will again produce the typical clinical picture on inoculation in healthy non-carrier stock.

*Corynebacterium Infection in Poultry.* D. M. Yegian, Amherst, Mass., Mass. Agric. Exp. Station, The Journal of the Am. Vet. Med. Ass., Vol. 85, 1934, p. 220.

Description of an organism, isolated from the organs of a Rhode Island Red pullet. At times this organism may prove to be pathogenic, in large doses, to chickens and guinea pigs.

*Studies on the Common Cold in Chickens.* Margaret Reed Lewis and Elizabeth Mueller, Carnegie Laboratory of Embryology, Johns Hopkins Medical School, Baltimore, Md. Journal of the Am. Vet. Med. Ass., Vol. 84, 1934, p. 759.

**Conclusion :**

The causative agent of the common cold of chickens failed to behave in a manner characteristic of the usual so-called filtrable virus diseases in that it did not confer a lasting immunity in the individuals recovered from the disease, it was not accompanied by a characteristic inclusion body in the cells of the lesion, it did not pass the bacteriologic filters, it was removed from solutions by amounts of particulate substances that removed bacteria, and it was present in 24-hour incubated broth cultures of the virus, but not in those that were free from bacteria.

*The Preisz-Nocard Bacil in Birds. La Bacille de Preisz-Nocard chez les Oiseaux.* A. Urbain, Comptes rendus de la Société de Biologie, Vol. 65, 1934, p. 1166.

Besides various other bacilli the author also found diphtheria bacilli of Preisz-Nocard in birds from zoological gardens. This bacil did not prove to be virulent for birds and lives therefore as saprophite in the diseased tissues.

*Culture of Virus described by Kikuth. Kultur und Mikroskopische Darstellung des von Kikuth beschriebenen Vogelvirus.* K. Herzberg, Zentralblatt für Bakteriologie, Orig., Vol. 130, 1933, p. 183.

The virus described by Kikuth and Gollub can be cultivated in chicken embryonal tissue in Tyrode-solution. Small bodies are found in the preparates, to which the cause of Canary Disease can be attributed. It is not known to which group the virus belongs but it might possibly be related to pox-virus.

*Sanitation and disinfectants on poultry plants.* W. L. Chandler, Abs. in Michigan Sta. Quart. Bul., 16, 1933, No. 1, pp. 44, 45.

The importance of various arthropods in the transmission of poultry diseases in poultry plants is considered and methods for their control suggested. In a test of the comparative efficacy of various disinfectants in sterilizing small amounts of finely divided avian fecal matter, colloidal iodine was the only material which consistently penetrated small particles of fecal matter and killed embedded bacteria within one half hour.

*The bactericidal Action of Izal. Enkele Onderzoekingen naar de bactericide Werking van Izal.* J. Voet, Tydschrift voor Diergeneeskunde, 1934, p. 181.

Experiments were undertaken to determine the bactericidal action of Izal on *B. coli*, paratyphus, pyocyaneus, pullorum and fowl cholera. These bacteria were killed within 5 minutes by a 0.2 percent solution. Izal is a very suitable disinfectant for poultry-farm, being not caustic and not expensive.

*Cause of the Diseases of the Organs of the Head. Über Ursachen und Erkennung der bei Hühnern an den Kopforganen seuchenartig vorkommenden Erkrankungen.* K. Heidkamp, Mitteilungen Bakteriologisches und Serum-Institut Dr. Schreiber, Landsberg, 1934, p. 57.

Description of (1) Diphtheria and Pox, (2) Coryza-contagiosa, (3) Avitaminosis, (4) Infectious Laryngo-tracheitis. No new points of view on these diseases are given.

*Immunity in Baby Chicks and Adult Birds. Über Infektionsverlauf und Immunität bei neugeborenen und erwach-*



*senen Tieren.* H.Kroo, Klinische Wochenschrift, 1933, II, p.1573. (Ref. Jahresbericht Veterinär-Medizin, Vol. 54, 1934, p. 301.)

In adult hens the infection with *Spirochaeta gallinarum* lasts 3-5 days and in chickens 16 days.

Adult hens become fully immune but no immunity develops in chicks.

*Spirochaetes in the Brains of Hens and Pigeons. Über die Verweildauer von Hühner-Spirochäten im Zentralnervensystem von Hühnern und Tauben.* B.Scharrer, Zeitschrift für Hygiene und Infektionskrankheiten, Vol. 116, 1934, p. 206.

*Spirochaetes* can penetrate to the brains of hens and pigeons but stay there but a short time longer (1-2 days) than in the blood and the internal organs.

*Transmission of Spirochetosis of Fowl to Pigeons. Transmission experimentale de la Spirochétose des Poules au Pigeon et au Lapin Persistance du Virus dans le Cerveau.* M. Stylianopoulos, Comptes rendus de la Société de Biologie, Vol. 112, 1933, p. 421.

The writer infected pigeons with fowl *spirochaetis*. By means of the brains of pigeons, which had been killed after they were cured, it was possible to transmit the *spirochaetis* to hens. The *spirochaetes* were also transmitted to rabbits by means of pigeons brains.

*Curing in Fowl-Spirochetosis. Zur Kritik der Phagocytenlehre VI. Über die Abwehrvorgänge im Organismus bei Hühner-Spirochätose.* I.L.Kritschewski and P.L.Rubinstein, Moskau, Virchows Archiv, Vol. 287, 1933, p. 566.

The organism of hens is freed from *spirochaetis* by means of the soluble action of the anti-bodies. Phagocytosis is a symptom which only occurs very rarely.

*Defense Mechanisms in Chicken Spirochetosis.* I. L. Kritschewski and P.L.Rubinstein, Abst. Arch. Path., XVII, 1934, 1, p. 125.

Chickens infected with *Spirochaeta gallinarum* were killed at different intervals. Histologic examination of the organs with special *spirochetal* stains revealed that the *spirochetes* gradually become dissolved after undergoing degenerative changes such as splitting and fragmentation. Phagocytic processes were seen only rarely and apparently do not play an essential rôle in the destruction of the *spirochetes*. It seems most likely that the destruction of the *spirochetes* is due to the action of specific lysins.

*An Outbreak of Aegyptianellosis in Pekin Ducks.* J.D.W. A. Coles, Journal of the South African Vet. Med. Ass., Vol. 5, 1934, p. 131.

Description of a case on infection by *Aegyptianella pullorum* in young Pekin ducks, at Pretoria North. The writer diagnosed the disease in chickens on the same farm about a year previously. *Argas persicus* was plentiful in the fowl houses.

*Trichomoniasis in Pigeons III. Über Trichomoniasis bei Tauben. III. Mitteilung: Weitere Beobachtungen über die Kultur und Pathogenität von Trichomonas Columbae.* A. Bos, Zentralblatt für Bakteriologie, I. Abl. Orig., Vol. 130, 1933, p. 220.

Besides on the L.E.S. medium of Boeck and Drbolav, *Trichomonas* can also be easily cultivated in liver bouillon. At 37° the optimal growth is reached after two days. Re-injections catch regularly after 2-5 days but not after 7 days.

The writer obtained bacteria-free cultures of *Trichomonas*. The 43rd generation was obtained in liver bouillon. They lived 8 days in liver bouillon and 19 days in egg media.

Injectons of the cultures into pigeons caused the disease.

Experiments with filtrates of cultures exclude the co-operation of a filtrable virus.

*Trichomonas columbae* can therefore be looked upon as the sole cause of Trichomoniasis in pigeons.

It is thus in the first species of trichomonas in which pathogene characteristics have with certainty been proved.

*A Preliminary Report on Trichomoniasis of pigeons.* E. F. Waller, Division of Vet. Med., Univ. of Minnesota, Univ. Farm, Saint Paul, Minn., Journal of the Am. Vet. Med. Ass., Vol. 84, 1934, p. 596.

#### Conclusions:

1. A disease of squabs due to trichomonads, that has not previously been reported from America, has been observed in two lofts of homing pigeons in the vicinity of University Farm.

2. The condition is manifested by the development of necrotic areas in the liver, pancreas, peritoneum, pericardium and lungs.

3. Mature birds have been found resistant to natural infection.

4. Since the disease has been transmitted by feeding the organism to susceptible birds, the probability of an intermediate host has been practically eliminated.

*Mortality in Fowls due to Aegyptianella pullorum.* J.D.W. A. Colis, Onderste poort. Journal of Veterinary Science and Animal Industry, Vol. 1, No. 9, 1933. *The Transmission of Aeg. Pullorum Carpano to Fowl by means of Ticks belonging to the Genus Argas.* G. A. H. Bedford and J. D. W. A. Coles, *ibid.*, Vol. 1, No. 15, 1933.

This parasite which occurs in the blood corpuscles of hens and other birds, was first described by Carpano in 1928, in native and

imported hens in Egypt. It was later found by Curasson and Andrejesky in French Sudan, by Donatien and Lestoquard in Algiers and by Robinson and Coles in South Africa. Brumpt carried out infection tests and by means of subcutaneous injections was able to infect hens, geese, turkeys, ducks and pigeons.

It is still uncertain as to what extent *A. pullorum* can be responsible for death. Brumpt reported a mild course, Donatien and Lestoquard anaemia and death in some cases, Carpano fever, paralysis and anaemia, spleen tumor, blood spots on the pituitary membrane. The disease was especially acute and fatal among imported birds.

Coles (1933) reports on the epidemics of *A. pullorum* in one of which there was an extremely high death rate among the very young chicks. In other two cases a few older birds were killed by this blood parasite but there were also birds which died from *Spirochaeta Anserina*. The symptoms in the chickens were loss of appetite and diarrhea and sometimes icterus. The post-mortem on the very young chickens showed severe icterus, anaemia, spleen-tumor, fatty degeneration of the liver, intestinal catarrh and a characteristic pale greenish-yellow colour of the kidneys. The older the birds became the less chance there seemed to be of their dying. Bedford and Coles (1933) carried out experiments in the transmission of *A. pullorum* by ticks, *Argas persicus*, *Ornithodoros moubata* and *Argas perengueyi*. *Argas persicus* proved to be the transmitter of this blood-parasite. The incubation period in chickens varied from 12-15 days. Foul grown ticks remained infectious for at least 162 days. The tick was able to infect healthy chickens twice with a period of about 4 months between each infection. It was not possible to transmit by means of *O. moubata* and *A. perengueyi*.

*Bang's Disease in Hens. Kommt die Bang'sche Krankheit (Brucellose) auch bei Hühnern vor?* Dr. W. Stockmayer, Archiv für Geflügelkunde, Vol. 7, p. 282.

**Summary :**

Bang's disease may be experimentally transmitted on chickens with large doses of cultures. Under natural conditions the infection is also possible, but occurs more rarely. The clinical symptoms after the infection with Bang's bacilli show a low rate and are passing by in a short time. The germs were found in the organs only in the first stage of the infection. The most certain diagnostic method is the blood test. Baby chicks did not show less resistance against Bang's bacilli as mature fowls.

The egg production of two infected flocks showed the same amount as in a normal flock. In the eggs of the infected hens Bang's bacilli could not be found; only the hatching result seemed to be somewhat influenced.

*Characters of Haemolytic Streptococci isolated from Pathological Conditions in Fowls.* Ph. R. Edwards, Dept. of Animal Path., Kentucky Agr. Exp. Station, Lexington, Ky., The Journal of Comp. Path. and Ther., Vol. 47, 1934, p. 152.

**Summary :**

Haemolytic streptococci isolated from cases of slipped tendon and from apoplectiform septicaemia of chickens were shown to be typical animal streptococci. Haemolytic streptococci said to have been isolated from bronchitis of baby chicks possessed the characters of streptococci of human origin.

*Studies on yeast-like fungi from gallinaceous birds.* E. Jungherr, Connecticut Storrs Sta. Bul. 188, 1933, p. 19.

In continuation of the author's studies, in which a severe outbreak of mycosis was reported, the epidemiologic occurrence of yeastlike fungi and their identification is taken up.

It was found that such fungi were not commonly associated with disorders of birds except in thrush affections, in which the chicken, turkey, pigeon, pheasant, quail, and grouse were infected. "*Monilia albicans*, *M. krusei*, and *Oidium* sp. were the organisms frequently found in thrush affections, of which *M. albicans* and *Oidium* sp. were thought to be of etiologic importance. The avian strains of *M. albicans* were indistinguishable from a type strain derived from human source, by morphologic, biochemical, agglutination, and agglutinin absorption tests. *Oidium* sp. from birds differed from *O. lactis* in morphologic and cultural reactions. Fermentation reactions carried out under uniform conditions on a representative number of strains were found to be of value in the classification of established types. It appears that *M. albicans*, *M. parapsilosis*, and *M. krusei* can be counted among the recognized types. Agglutination tests differentiated the *M. albicans*-*M. candida* group from *M. parapsilosis*, *M. krusei*, and *S[accharomyces] fibuliger*. They failed to differentiate between the pathogenic *M. albicans* and the saprophytic *M. candida* type. The terminology of thrushlike affections of birds should be clarified by applying the terms 'moniliasis' and 'oidiomycosis' to disorders caused by members of the implied genera."

A list of 44 references to the literature is included.

*Mycosis in Fowl caused by Yeast-like Fungi.* E. Jungherr. Agric. Exp. St., Storrs Journal of the Am. Vet. Med. Ass., Vol. 84, 1934, p. 500.

**Summary :**

In summarizing our present knowledge of mycotic infections in fowl, caused by yeast-like fungi, it can be said that the diseases affect principally the mucous membranes of the upper digestive tract. The infections occur in all domesticated birds and in game birds raised in captivity, and predominate during wet, early summer seasons. In very young birds the infections may be accompanied by heavy mortality. Immune carriers of the maladies seem to be uncommon but the organisms appear to be capable of maintaining life in a non-parasitic state. The organisms are probably widespread in nature, but it is not known under what set of conditions they assume invasive properties; they are resistant to disinfection with common coal-tar derivatives. *Monilia albicans* is the principal cause of moniliasis and *Oidium pullorum* n. sp. of oidiomycosis in fowl.

*Studies on an uncomplicated coryza of the domestic fowl, I, II.* J. B. Nelson, Jour. Expt. Med., 58, 1933, p. 289, 297.

This contribution is presented in two parts.

I. The isolation of a bacillus which produces a nasal discharge.—This is a report of studies of a form of coryza thought to be identical with the condition known as catarrhal roup in the older literature and later designated contagious catarrh. It is pointed out that a fowl coryza of this type has been recently studied in the Netherlands by De Bleeck, who isolated a hemophilic bacillus from a blood agar plate streaked with

nasal exudate from a naturally affected fowl. To this bacillus, which resembled the human influenza bacillus, he gave the name *Bacillus haemoglobinophilus coryza gallinarum*.

By a method combining filtration and cultivation, the author isolated an unidentified Gram-negative bacillus from the nasal exudate of fowl experimentally infected with an uncomplicated coryza. Isolation was accomplished by cultivation on sealed blood agar plates after unsuccessful attempts to produce colonies on open plates. Injection of the organism into the palatine cleft of normal birds was regularly followed by an inflammation of the nasal mucosa and a discharge from the nares. A parainfluenza bacillus which was also recovered from the nasal tract of affected fowl was innocuous. Certain cultural characters of the bacillus, bearing on its classification, are considered.

II. The relation of the "bacillary" coryza to that produced by exudate.—The intranasal injection into normal birds of exudate from natural cases resulted in the development of three types of an uncomplicated fowl coryza, differing in the onset and duration of symptoms.

"Protection tests were carried out with two of the types in an attempt to explain why the 'bacillary' disease regularly ran a shorter course than the 'exudate' disease. Reciprocal protection was demonstrated in one case, but in the other the birds which had recovered from the bacillary disease were susceptible to reinfection with exudate. There was no indication, however, that a second infectious agent was present in the exudate, and the failure to cross-immunize was ascribed, rather, to a reduction in the immunizing properties of the specific bacillus induced by artificial cultivation.

"It was also noted that the coryzas produced by exudate and bacilli, respectively, could be transmitted from infected birds to normal ones by direct contact. In both cases 1 bird out of 5 failed to contract coryza on exposure. These 2 birds were later injected with the respective agents to which they had been exposed and found to be resistant."

*Lymphomatosis, myelomatosis, and endothelioma of chickens caused by a filterable agent.—I, Transmission experiments.* J. Furth, Jour. Expt. Med., 58, 1933, p. 253.

The author describes a new transmissible strain of leucosis of chickens that causes "(1) lymphomatosis with or without tumor formation and with or without leukemia, (2) myelocytomatosis with or without leukemia, and (3) endothelioma. All these diseases are transmissible by material free from viable cells, and the available evidence indicates that they are caused by a single filtrable agent."

A list is given of 23 references to the literature.

*Clostridium botulinum, type C, associated with western duck disease.* J. B. Gunnison and G. E. Coleman, Jour. Infect. Diseases, 51, 1932, p. 542.

This is a report of a comparative study made of a strain of *C. botulinum*, type C, involved in duck disease with other strains of this type, the cultural, serologic, and toxicologic properties being determined and the relative toxicity of the various strains for ducks and chicks tested. The duck strain used was isolated from the liver of a duck suffering from dick disease. This strain, referred to as type Ca, was found to closely resemble other American strains of this organism in such properties.

Guinea pigs, mice, and rabbits were found to be highly susceptible to the toxin produced by this strain when the toxin is injected subcutaneously, but were relatively resistant to it when it was given by mouth. Mice were more resistant than guinea pigs to this toxin when it was given by mouth. Ducks were found to be susceptible to the toxins of type C orally administered. The strain of type C $\beta$  isolated by Seddon was found to be approximately ten times more toxic for ducks than the other strains. Chickens were found to possess a high degree of immunity to all the toxins of type C tested. The detoxified spores of the strain of *C. botulinum*, type Ca, isolated from a duck were harmful when fed to ducks in single doses up to 585,000,000.

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# GENERAL

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## ANNUAL RERORTS

*Swiss Poultry Breeders Annual 1935. Schweizerisches Jahrbuch für Geflügelzucht, Kaninchenzucht, Taubenzucht, Vogelschutz und Vogelliebhaberei, 1935.* Editor: Tierwelt-Verlag, Lofingen.

Of its contents we make mention of:

Accompanying phenomena with breeding for high production. Difficulties for poultry judges.

Marketing poultry products. Book-keeping. Monthly work for the poultry breeder. List of different breeds.

This calendar also contains many articles on pigeon-breeding.

*Calendar for Poultry Breeders 1935. Kalender für Geflügelzüchter 1935.* Jahrbuch der Reichsfachschaften Landwirtschaftliche Geflügel- und Herdbuchzüchter sowie Ausstellungsgeflügelzüchter im Reichsverband Deutscher Kleintierzüchter. Vol. 37. With 111 illustrations. Editor: Fritz Pfenningstorff, Steinmetzstraße 2, Berlin W. 57.

This calendar is the official organ of the Government Breeders Association. It is really a collection of very important reports of several German experts, containing also the annual reports of the nineteen German poultry experiment stations.

Of its contents we make mention of:—

Poultry Husbandry in Germany by Karl Vetter; Annual reports of Poultry Experiment Stations; Results of German laying Competitions 1932-33; Summary of the hereditary doctrine, by Dr. Bartsch; The nourishing value of foods, with detailed tables, by Prof. Lehmann; The examination of foods, by Dr. Fangauf; New researches into the poultry feeding; Artificial incubation; Chick rearing; Fattening poultry; Post-mortem examination; Pigeon diseases; Summary of egg-production and table poultry in Germany; The arrangement of exhibitions.

*Chanticleer Annual 1935.* Southern Counties Poultry Society. E. Hugh Hudson, Chilworth near Guildford, Surrey, 1935.

### Contents:

Introduction; Fundamental principles of incubation and brooding. S. C. P. S. trading department. Is re-organised marketing the key to

profitable poultry keeping? Chanticleer index, chanticleer exchange list. Practical methods of prevention of some common diseases. S. C. P. S. scheme of feeding. The cycle of the year for novices. Commercial gardening. Adequate diet for poultry. Southern layings Test, four years figures. Hatchable egg quality. List of members.

*Poultry Investigations. Annual Report for the fiscal Year ending June 30, 1933. Agricultural Experiment Station, University of Florida, Gainesville, Florida.*

Several investigations with chicks, laying hens and turkeys are being conducted cooperatively at the West Central Florida Experiment Station (Chinsegut Hill) together with the Animal Husbandry Division, Bureau of Animal Industry, U. S. Department of Agriculture. N. R. Mehrhof, Extension Poultryman, is associated with these projects.

*Investigations with livestock at the Louisiana Station. Louisiana Sta. Rpt. 1932-33.*

With poultry, results are also briefly reported of investigations on the use of shrimp meal with meat scrap in growing and laying rations, rearing chickens in confinement to control coccidiosis, examinations of eggs failing to hatch, and the use of electric heat in battery brooders.

*Experiments in animal production by the Ohio Station. Ohio Sta. Bul. 532, 1934.*

The poultry experiments yielded information on individual laying batteries for hens, triple-purpose pen batteries, a comparison of fresh range, contaminated range, and wire screen porch for production of pullets, all by Kennard and V. D. Chamberlin; the effect of fluorine in the nutrition of the chick, by C. H. Kick, Bethke, and Record; the comparative nutritive value of different fish meals for chicks, by Record, Bethke, O. H. M. Wilder, and Kennard; the relation of the vitamin G complex to hatchability and nutritive value of the eggs, by Bethke and Record; and effect of equivalent units of vitamin D in the form of a cod-liver oil concentrate and irradiated ergosterol on hatchability and the vitamin D content of the egg, by Bethke, Record, and Wilder.

*Investigations with livestock at the Arkansas Station. Arkansas Sta. Bul. 297, 1934.*

With poultry, results are briefly reported on the use of brewers' rice, rice polish, and rice bran in comparison with standard grains in growing and laying rations, and the influence of minerals, cod-liver oil, germinated oats, and alfalfa leaf meal on production, hatchability, fertility, and egg weight.

*Investigations with livestock in Iowa. Iowa Sta. Rpt. 1933.*

The poultry work included studies on the biological value of meat scrap and milk combinations for egg production, egg yolk and chicken fat as preventives of rickets and slipped tendons of chicks, and comparison of avian embryonic growth rates as measured by nitrogen and



ash content, all by E. W. Henderson; association of the date of hatch, date of first egg, and maturity with egg production, and influence of selection and breeding upon egg production and maturity, both by N. F. Waters; the effect of inbreeding, linebreeding, outbreeding, and crossbreeding, by Waters and W. V. Lambert; and the influence of protein levels and calcium and phosphorus balance upon rachitis of chicks, by H. L. Wilcke, Henderson, and C. Murray.

*Experiments with Poultry in Virginia.* Virginia Sta. Rept. 1928-1931, p. 72.

*Peanut meal as a source of protein for laying hens.*

Rations in which peanut meal were substituted for meat scrap in varying proportions were fed to five lots of 25 Barred Rock pullets each. At the end of six months the results indicated that peanut meal could be substituted for some of the meat scrap without decreasing egg production or injuring the quality of the eggs.

*Pigmentation in chicks reared in battery brooders.*

In a test with five lots of 50 Barred Rock chicks each in a battery brooder, the results obtained during an eight-week period indicated that the addition of alfalfa leaf meal increased the pigmentation of shanks and beaks without affecting the growth of the chicks.

*Mazda CX lamp as a source of ultra-violet rays for poultry.*

At the end of eight weeks of a test there were no signs of rickets among lots of chicks fed cod liver oil and in lots irradiated with a Mazda CX lamp, while in the control lot practically 100 per cent of the chicks were rachitic.

## SUNDRIES

*Treatment of Geese Feathers and Down with alkali Solutions.* A. A. Grebenschikov, Transactions of the Poultry Research Institute of U. S. S. R. in Moscow, Vol. II, 1934, p. 20.

**Summary :**

The present investigation consisted in the study of the effect of various factors upon the quality of geese feathers and down when treated with solutions of caustic soda, ash soda, soap, and ash soda with soap.

Observations were principally performed on the washing of grease and dirt out of the product at various temperature, concentration of the solution and on the length of processing. At the same time there was studied the effect of the conditions mentioned above upon the deodorization of the product, and the looseness and cohesion of the down.

The grease content in the material was 5.25 percent in the down and 2.82 percent in the feathers. It was possible to decrease the content of grease up to 0.97 percent in the down and to 0.83 percent in the feathers.

The most effective results are obtained by the treatment with the solution of ash soda and soap at the temperature of 50° C. The concentration of the solution depends on the degree of greasiness and soilure of the product and may vary from 0.1 + 0.06 percent to 0.2 + 0.4 percent for down and from 0.06 + 0.06 percent to 0.1 + 0.1 percent for feathers.

*Germany's Production, Importation and Consumption of Eggs.* Journal of the Department of Agriculture, Dublin, Vol. 32, p. 391.

The number of hens in Germany has increased from 64.12 million in 1925 to 84.12 million in 1932. During the same period the total production and consumption of eggs, and also the number of eggs consumed per head of the population were as follows:

	Production in Millions	Consumption in Millions	Number of eggs consumed per head of population
1925	4,309	2,418	107.9
1926	4,615	2,360	111.0
1927	5,099	7,797	123.3
1928	5,528	8,469	133.1
1929	5,946	8,696	136.0
1930	6,273	8,910	138.6
1931	6,342	8,667	134.1
1932	6,065	8,428	129.9

*Poultry Census in Germany.* 3rd December 1933.

Poultry	1912	1930	1931	1932	1933
Geese	5,850,775	6,230,393	5,676,698	5,784,556	6,134,895
Ducks	2,086,330	3,886,422	3,543,895	3,523,889	3,470,186
Chickens except Turkeys & Guinea-fowls	63,970,300	87,937,284	84,058,565	84,119,187	87,052,549
Of which laying hens	—	69,510,800	67,346,968	68,318,921	63,917,539
Poultry in General	71,907,405	98,054,099	93,279,158	93,427,632	96,657,630

*Poultry Culture in Lithuania.* *Geflügelzucht in Litauen.* Eier-Börse 1934, p. 64.

The Poultry census showed, within the last few years, the following results:

Year	Chickens	Geese	Year	Chickens	Geese
1933	2,940,920	985,525	1930	2,262,000	795,000
1932	3,082,720	893,004	1929	2,010,000	623,500
1931	3,740,640	241,570	1928	2,218,800	873,300

*The Dutch Poultry and Egg Industry.* Journal of the Department of Agriculture, Vol. 31, Dublin, Ireland.

Poultry farms are to be found in all parts of Holland, and practically all farmers are members of one or other of the many poultry associations, which in turn are affiliated to some large federation. The largest of these latter bodies comprises 14 associations, with a total membership of 90,000. The following table shows the six principal breeds reared and the average number of eggs laid annually by birds of each breed.

	One Year Old	Older than 1 year
White Leghorns . . .	140 to 190	135
Twentsche Griizen . .	130 to 180	130
Barnevelders . . . .	110 to 140	115
Rhode Island Reds . .	130 to 150	120
White Wyandottes . .	120 to 140	105
Welsumers . . . . .	70 to 110	80

The annual production of eggs in Holland amounts approximately to 2,000 millions. Of this quantity, 1,100 millions are exported, about

800 millions are consumed at home, and about 50 millions are used for breeding purposes. The consumption of eggs per head of the population is about 100 eggs per annum.

*Two million less Poultry in Canada.* Canada Poultryman, March 1934.

The number of hens and chickens on December 1, 1933, is estimated at 4,147,400—14.2 per cent below the numbers at June 1, 1933, but only 4.2 per cent below the numbers at December 1 of the previous year.

The marketing intentions for the six months following December 1, 1933, reflect the decrease in numbers of poultry on farms. Pullets and cockerels are 30.1 per cent less than a year ago, hens and cocks 29.6 per cent, turkeys 20 per cent, ducks 30.4 per cent and gees 21.0 per cent, with a total decrease of 29.9 per cent for all classes.

*Economic Factors Affecting the Production and Marketing of Poultry Products in Utah. Miscellaneous Publication 9—Second Preliminary Report.* W. P. Thomas and M. Clawson, February, 1932, Agric. Exp. Station, Logan, Utah.

The average per-hen capital invested in 1930 was \$ 2.75, as against \$ 3.16 in 1929. The average annual per-hen production was 165 eggs as compared to 152 eggs for 1929; egg-production cost was 24.8 cents in 1930, as compared to 26.5 cents in 1929. Comparable results were also found in regard to rearing pullets: In 1929 this cost, not including labor, was 76 cents; in 1930 this amounted to 77 cents. With labor, these cost items for 1929 and 1930 are 96 and 97 cents, respectively. Death loss in laying flocks for all farms in 1930 was 21.3 per cent, whereas it was but 16.6 per cent for 1929. This second preliminary report on the analysis of the poultry business for 1929-30 will be followed by a third report in the fall of 1932 which will include a three-year summary of this industry in Utah.

*Economic factors affecting Poultry Production and Marketing in Utah: 1929, 1930, 1931.* W. P. Thomas and M. Clawson, November 1933, Utah Bull. No.244.

This study includes an analysis of some of the general economic factors affecting poultry production in Utah, such as competition with other poultry-producing areas, available feed-supply, variations in egg prices, and marketing of poultry products. The second part of this study includes an analysis of the factors entering into production, costs, and returns as found on Utah poultry farms. This analysis represents: 1. A report on the entire farm business as a unit, 2. an analysis of the poultry enterprise, 3. the cost of producing eggs, 4. the cost of rearing pullets, and 5. the influence of certain factors as they relate to the costs and returns of the individual poultrymen.

*Cost of Producing Pullets in Wisconsin, 1933.*

The Michigan State College of Agriculture has issued a circular bearing the above title, which states that detailed records were kept by 51 farmers, of whom the majority were breeders of White Leghorns. The number of chickens on each farm was from 200 to 2,642. The earliest hatched chicks were taken from the incubators on 2nd March and the

latest hatched on 10th June. Mortality to the end of a 24-weeks period ranged from 2 per cent. to 65 per cent. which proved that mortality had a direct bearing on the cost of producing pullets to the age of 24 weeks. Light breeds hatched out in late April and reared on clean ground had the lowest mortality. In the case of these light flocks, the cost of pullet production was 14.3 cents per pound, and the profit 5.1 cents per pound, while in the heavy breeds hatched early, the cost of production was 17.1 cents per pound and the profit only 1.4 cents per pound. For the heavier breeds, the production of "broilers" was considered the most profitable, provided the birds were hatched early, fed efficiently, and sold on special markets.

The more important findings might be summarized as follows:—1. The average cost per pullet to the end of 24 weeks was 53 cents; 2. Mortality during the period averaged 16.6 per cent, and 3. The total costs were distributed as follows—Feed, 43 per cent., cost of chicks 23 per cent., Labour 14 per cent., equipment, buildings, and other costs 20 per cent.

### *Farm Production and Consumption of Poultry in Kansas.* Bulletin 256, Agric. Exp. Station, Manhattan, Kansas.

This bulletin reports the results of a study of farm flocks in nine Kansas counties. It shows the breeds of chickens kept and their relative importance; also the size of flocks. The composition of the farm flock, egg production per flock and per hen, and the disposal of eggs produced are discussed. The time of hatching, the number of chicks hatched and where hatched are given. Average sales per month of poultry and eggs are shown, together with the values. The per capita farm consumption of eggs and poultry is shown by the month and for the year. Death losses of both mature birds and baby chicks are discussed.

### *Poultry Houses and Equipment.* J. E. Dougherty and H. L. Belton, Agric. Exp. Station, Berkeley, California, Bull. 476, 1933.

Description with 79 illustrations. Contents: Requirements of a California Poultry House, construction Materials, Construction Details, Commercial Laying House, Brooder House, Feed Rooms, Yards for Poultry, Poultry House Appliances, Hoppers, Catching Devices, Watering Devices, Increasing the Effectiveness of electric Lights in a poultry House, Descriptive List of Materials.

### *The Housing of Poultry.* I. Rhys, Ministry of Agriculture and Fisheries, London, Bulletin Nr. 56, 1933, Price 2.5. Contents:

Introduction: Floors. Ventilation. Light. Roofs. Doors. Nests. Timber. Methods of Switching for Lights.

Multiple-Unit Brooder House: Construction of Floors. Use of Wire Floors. Sun Porches.

Colony Brooder House for 100 Chicks. Incubator House. Multiple-Unit Laying House. Lancashire Cabin. Summer Range Shelter. Double Breeding-Pen House. Sussex Ark. Slatted-Floor Laying House. Fold System. Mash Hoppers. Water Stands. Catching Crate. Gates.

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